CHAPTER 3

AFFECTED ENVIRONMENT

3. AFFECTED ENVIRONMENT

This chapter describes the environment at and around Luke AFB (as appropriate), providing baseline information to allow the evaluation of potential environmental impacts that could result from the Proposed Action, Implementation Alternative, or the No Action Alternative. As stated in 40 CFR 1508.14, the human environment includes natural and physical resources and the relationship of people to those resources. The environmental baseline resource areas described in this chapter were selected after identifying the potential issues and concerns related to the Proposed Action, Implementation Alternative, and No Action Alternative. Only relevant resource areas near Luke AFB are described. These include **Aircraft Operations and Safety**; **Air Quality**; **Biological Resources**; **Noise and Land Use**; **Socioeconomics**; and **Environmental Justice**.

In accordance with 40 CFR 1502.15, the resource areas that would *not* be impacted are not described in this chapter, nor evaluated in Chapter 4. These are listed below, with a brief explanation for their omission from the analysis.

- **Geological Resources**. No construction or other impact to ground surface is included in the Proposed Action or any alternative. Therefore, there is no potential impact to geology or soils.
- **Water Resources**. No activities would occur to affect water quality by creating erosion, runoff, or changes in groundwater recharge area. The increase in student pilots would increase the number of persons who work and reside on Luke AFB by only about 2.5 percent, and the resulting increase in drinking water demand would be negligible. Therefore, there is no potential impact to water resources.
- **Visual Resources.** No structures would be built or demolished, and the total number of flying operations would not change as a result of the Proposed Action or an alternative. Therefore, there would be no effects to the visual environment.
- **Cultural Resources**. No ground disturbance would occur, and there would be no changes in the location of flying operations that would involve overflight of cultural sites. Therefore, there is no potential impact to cultural resources.
- **Transportation.** No construction vehicles would be involved with any action. The student pilots reside on base during the training period and would not contribute to peak hour traffic at the gates, and would have only marginal effects on traffic on or off base. Therefore, no potential transportation impacts would occur.
- **Environmental Programs.** There would be no change in the number of flight operations or aircraft, and no changes in the quantities or types of hazardous materials used or hazardous waste generated from aircraft operations or maintenance. The small increase in student pilot numbers would lead to negligible increases in solid waste and wastewater. No building demolition is involved, so there would be no effects related to asbestos, lead-based paint, pesticides, or other toxic materials. Therefore, there is no potential impact to environmental programs.

The order of resource description is based on introducing the mission (aircraft operations and safety), the physical environment (air and biological resources), and the human environment (noise and land use; socioeconomics; and environmental justice).

HISTORY AND MISSION

History of Luke Air Force Base

Luke AFB is named for the first aviator to receive the Medal of Honor, Lt. Frank Luke, Jr. Born in Phoenix in 1897, the "Arizona Balloon Buster" scored 18 aerial victories during World War I (14 of these German observation balloons) in the skies over France before being killed, at age 21, on Sept. 29, 1918.

In 1940, the U.S. Army sent a representative to Arizona to choose a site for an Army Air Corps training field for advanced training in conventional fighter aircraft. The city of Phoenix bought 1,440 acres of land, which they leased to the government at $1 a year effective March 24, 1941. On March 29, 1941, excavation was begun for the first building at what was then known as Litchfield Park Air Base. Shortly afterwards, the new base became known as Luke Field.

Luke has a long and distinguished history of training pilots. The first class of 45 students arrived June 6, 1941 to begin advanced flight training in the AT-6, although only a few essential buildings had been completed. Flying out of Sky Harbor Airport until the Luke runways were ready, pilots received 10 weeks of instruction and the first class graduated in August 1941. Capt. Barry Goldwater served as director of ground training the next year.

During World War II, Luke Field was the largest fighter training base in the Army Air Corps, graduating more than 12,000 fighter pilots from advanced and operational courses in the AT-6, P-40, P-51 and P-38, and earning the nickname, "Home of the Fighter Pilot." By early 1944, pilots at Luke had achieved a million hours of flying time. By 1946, however, the number of pilots trained dropped to 299, and the base was deactivated in November of that year.

As combat developed in Korea, Luke Field was reactivated in 1951 as Luke Air Force Base, part of the Air Training Command under the reorganized U.S. Air Force. Students progressed from the P-51 Mustang to the F-84 to the F-104 Starfighter. In July 1958, the base was transferred from Air Training Command to Tactical Air Command.

During the 1960s, thousands of American fighter pilots left Luke AFB to carve their niche in the annals of Air Force history in the skies over Vietnam. In 1971, the base received the F-4C Phantom II and became the main provider of fighter pilots for Tactical Air Command and fighter forces worldwide. In 1974, the Air Force's newest air superiority fighter, the F-15 Eagle, came to Luke. It was joined in December 1982 by the first F-16 Fighting Falcon, for which training began in early 1983.

The early 1990s brought significant changes to the base. As a result of defense realignments, the F-15A and B models were transferred out, and the 58th Tactical Training Wing was re-designated the 58th Fighter Wing and became the host unit at Luke. In April 1994, the 58th Fighter Wing was replaced by the 56th as part of the Air Force Heritage program, which was established to preserve the Air Force legacy and its history during the defense drawdown (USAF, 2001a).

Today, Luke AFB is part of the Air Education and Training Command, and is the largest fighter training base in the world. It is home to the 56 FW and its eight squadrons, and to the 944 FW of the U.S. Air Force Reserve Command.

History of the 56th Fighter Wing

Luke AFB's 56 FW was established in Savannah, Georgia in January, 1941, as the 56th Pursuit Group. Its earliest history was marked by frequent moves, to North Carolina in May 1941 and then to New York in 1942. Using P-39 and P-40 aircraft, the unit flew air defense patrols until June 1942, when the unit became the first to train with and fly the P-47 Thunderbolt.

The wing left for England in January 1943. During the following two years, pilots of the 56 FW destroyed more enemy planes and listed more aces than any other Army Air Force group in the 8th Air Force, including the top two aces in Europe. By the war's end, the Wing's motto—*Cave Tonitrum* (Beware the Thunderbolt)—was highly respected by both the Allies and their enemies.

In October 1945 the unit was inactivated, but was reactivated in May 1946 at Selfridge Field, Michigan, as part of the Strategic Air Command's 15th Air Force. In July and August 1948, a major operation of the 56 FW involved 16 of its F-80 aircraft. The flight proceeded to Germany by way of Maine, Labrador, Greenland, Iceland and Scotland. Although the operation was not connected with the Berlin Airlift, it did focus world attention on the U.S. Air Force's ability to rapidly deploy jet fighters during a crisis.

The wing was transferred from the Strategic Air Command to the Continental Air Command's 10th Air Force in December 1948, and the mission of the wing's tactical units was shifted to air defense. The unit was redesignated as the 56th Fighter Interceptor Wing on January 20, 1950, and its fighter squadrons converted from the F-80 Shooting Star to the F-86 Sabrejet in April of that year.

The wing, with the exception of its four tactical squadrons, was deactivated in February 1952. The tactical squadrons were reassigned to the new air defense wings as part of a general reorganization of the Air Defense Command (ADC). Almost nine years later, having been redesignated the 56th Fighter Wing (Air Defense), the wing was reactivated at K.I. Sawyer AFB, Michigan, again with an air defense mission. The wing controlled a single tactical unit flying the F-101 Voodoo.

From February 1961 to October 1963, the wing was part of the Sault Sainte Marie Air Defense Sector. From October 1963 to January 1964, the wing was an important part of the Duluth Air Defense Sector. Under both sectors, the wing participated in many ADC exercises, tactical evaluations, and other air defense operations. In January 1964 the wing was assigned to the Strategic Air Command and inactivated.

Three years later, the wing was reactivated at Nakon Phanon Royal Thai AFB, Thailand. The combat and support operations of the wing in Southeast Asia were numerous and varied as it supported the Southeast Asia conflict in a wide variety of specialized and general operations. The wing headquarters earned unit awards with the Combat "V" device and the Republic of Vietnam Gallantry Cross with Palm.

In June 1975, the wing moved to MacDill AFB, and was redesignated the 56th Tactical Fighter Wing and assigned to Tactical Air Command's 9th Air Force. In October 1981, the wing's designation was changed once again, from a tactical fighter wing to a tactical training wing.

June 1988 marked another transition for the wing. It began its conversion from the F-16A/B models to the updated F-16C/Ds. With the F-16C/Ds, the wing remains the primary F-16 aircrew and maintenance training wing in the Air Force. The wing was reassigned to Luke AFB April 1, 1994. The 56 FW is one of the most highly decorated units in Air Force history. Today, units flying the F-16 Fighting Falcon at Luke AFB are the 21st, 61st, 62nd, 63rd, 308th, 309th, 310th, and 425th Fighter Squadrons of the 56 FW, along with the 944 FW of the U.S. Air Force Reserve Command, a tenant unit at Luke AFB (USAF, 2001).

3.1. AIRCRAFT OPERATIONS AND SAFETY

The stated mission of the 56 FW is to "Train the world's finest F-16 pilots and crew chiefs while providing agile combat support for aerospace expeditionary forces." In support of this mission, approximately 800 pilot trainees flow through Luke AFB training programs each year and nearly 125,000 training flight operations occur.

3.1.1. Aircraft Operations

Luke AFB has two parallel runways, oriented northeast (03L/03R)-southwest (21L/21R) (see Figure 1.5-3). The west runway (03L/21R) is 10,000 ft long, while the east runway (03R/21L) is 9,910 ft in length; both are 150 ft wide. The numerical runway designations correspond with the approximate magnetic heading of the runway (i.e. "03" corresponds to 30° from magnetic north, while "21" corresponds to 210° from magnetic north). The runways are further designated with an "R" for right and an "L" for left as a pilot views them on final approach. The runways are 1,090 ft above MSL.

There are nearly 127,800 total flight operations at Luke AFB each year, averaging approximately 450 operations per day. An aircraft operation is considered one arrival, one departure, or one-half of a closed pattern. A closed-pattern routine is defined as an aircraft in an established flight track around the runway that performs any number of instrument or visual approaches or touch-and-go (TGO) activities prior to a complete landing. A sortie is an event that includes the phases of a takeoff and landing cycle with some type of established activity prior to the return and complete landing at the airfield. Table 3.1-1 shows the average number of annual and daily operations by aircraft type.

There are approximately 210 aircraft based at Luke AFB, all F-16 Fighting Falcons. Most of the F-16 aircraft have a 220 engine; approximately 6 percent have a 229 engine, which is slightly louder than the 220. Of the flights by aircraft based at Luke AFB, 94 percent are by F-16s with the quieter 220 engines (USAF, 2001a).

Luke-based aircraft account for 97 percent of flight operations at Luke's airfield. The remaining 3 percent of operations are conducted by transient or deployed aircraft of various types. *Transient* aircraft temporarily use the Luke AFB airfield but are based elsewhere. Transient activities include using the airfield facilities while en route to another destination, transporting personnel or materiel to or from Luke AFB, and other purposes. *Deployed* aircraft (and support personnel) are temporarily assigned to Luke AFB from their home base to participate in training activities with Luke personnel and aircraft. For example, in FY 2001, approximately 60 fighter and trainer aircraft were deployed to Luke AFB for an average stay of 13 days. Most of these aircraft were F-15 fighters.

Table 3.1-1.
Luke AFB Total Flight Operations[1]

Aircraft Type	Annual			Average Daily Total
	Day	*Night*	*Total*	
Based Aircraft				
F-16 (220 Engine)				
Arrivals / Departures	78,915	4,211	83,126	296.88
Closed Patterns[2]	33,253		33,253	118.74
Subtotal	**112,168**	**4,211**	**116,379**	**415.62**
F-16 (229 Engine)				
Arrivals / Departures	5,046	269	5,314	18.96
Closed Patterns[2]	2,128		2,128	7.58
Subtotal	**7,174**	**269**	**7,442**	**26.54**
Total for Based Aircraft	**119,342**	**4,480**	**123,822**	**442.16**
Percentage by time of day	***96%***	***4%***	***100%***	
Transient / Deployed Aircraft[3, 4]				
A-10A	95		95	0.26
C-5A	168		168	0.46
C-21A	95		95	0.26
C-130E	110		110	0.30
F-15A	139		139	0.38
F-15E				
Arrivals / Departures	1,509	83	1,592	4.48
Closed Patterns[2]	634		634	1.76
F-16 (220 Engine)	248		248	0.68
F-18	175		175	0.48
T-1	66		66	0.18
T-38A				
Arrivals / Departures	448	11	459	1.65
Closed Patterns[2]	112		112	0.40
UH-60A	73		73	0.20
Total Transient / Deployed[5]	**3,871**	**94**	**3,965**	**11.48**
Percentage by time of day	***98%***	***2%***	***100%***	
Total, All Aircraft[5]	**123,212**	**4,574**	**127,787**	**453.70**
Percentage by time of day	***96%***	***4%***	***100%***	

[1] Based and deployed aircraft are calculated at 280 days/year, while transient aircraft are calculated at 365 days/year.

[2] An arrival or departure equals one operation; a closed pattern equals two operations (i.e., a plane that departs and returns results in two operations). The numbers have been adjusted accordingly.

[3] When there were very small numbers of a transient aircraft type, those numbers were combined with an aircraft type having a similar noise profile.

[4] All numbers are arrivals and departures (combined) unless noted otherwise.

[5] Numbers may not add due to rounding.

Source: USAF, 2001a

Most of the flights at Luke AFB take place between 7:00 a.m. and 10:00 p.m. Flights at night (between the hours of 10:00 p.m. and 7:00 a.m.) are considered more annoying than noise occurring during daytime (see Section 3.4.1). For this reason, the Air Force limits nighttime flights and other noise-generating operations to the extent possible within the confines of achieving its mission objectives. At Luke AFB, less than 4 percent of all operations between May 2000 and May 2001 occurred between 10:00 p.m. and 7:00 a.m. In recognition of the nighttime annoyance factor, the computer model (NOISEMAP 6.5) used by the Air Force to develop noise contours based on airfield operations adds a 10 dB "penalty" to operations that occur after 10:00 p.m. The effect of this penalty is a slight increase in the size of the affected noise contour(s).

3.1.2. Flight Safety

To ensure the safety of personnel and the public and to avoid loss of property around installations, the Air Force implements safety controls in all phases of flying operations. The Air Force conducts a comprehensive flight safety program to ensure the airworthiness of each aircraft, the proficiency of the crews, and the safety of airborne operations. Also, training flights are routed over sparsely populated areas whenever possible.

The Air Force classifies mishaps into categories—Class A, Class B, Class C, and High Accident Potential. A Class A mishap results in a total cost in excess of $1 million for injury, occupational illness, and property damage; a fatality or permanent total disability; or destruction or damage beyond economical repair to Air Force aircraft. A Class B mishap results in a total cost in excess of $200,000 (but less than $1 million) in property damage; permanent partial disability; or, hospitalization. A Class C mishap results in excess of $10,000 (but less than $200,000), or an injury or occupational illness that results in a loss of worker productivity greater than eight hours. Mishaps not meeting the definitions of Classes A, B, or C, which because of damage or injury necessitate Air Force reporting, are classified as High Accident Potential. The Air Force's 10-year average is 1.52 mishaps per 100,000 flying hours (AFSC, 2001).

Because the areas to the northeast of Luke AFB are more densely populated than the areas to the southwest, no flights carrying live ordnance can use Runways 03L/03R to the northeast (Luke AFB Supplement to AFI 11-2F-16V3). Less than 5 percent of flight operations involve the use of live ordnance.

3.1.3. Air Installation Compatible Use Zone Program

The purpose of the Air Force AICUZ program is to ensure safety by promoting land use compatibility between Air Force installations and the surrounding civilian community. The AICUZ program is governed by AFI 32-7063, *Air Installation Compatible Use Zone Program; s*upporting AFIs include 32-1026, *Planning and Design of Airfields*, and 32-1026, *Airfield Clearance Criteria.*

The AICUZ program has two objectives: to assist local, regional, state, and federal officials in protecting and promoting the public health, safety, and welfare by encouraging compatible development within the AICUZ area of influence; and to protect Air Force operational capability from the effects of land use that are incompatible with aircraft operations.

To achieve these objectives, the AICUZ program designates safety zones around each runway and provides land use compatibility recommendations. To determine the needed safety zones, the Air Force analyzed aircraft accidents within 10 nautical miles of an airfield for a 4-year period, and designated a Clear Zone and Accident Potential Zones I and II around each runway. The analysis found that nearly two-thirds of mishaps occurred within the CZ, which extends 3,000 ft from each end of a runway. The APZ I, in which 8 percent of accidents occurred, extends another 5,000 ft beyond the CZ. Only 5 percent of accidents occurred within APZ II, which extends 7,000 ft beyond APZ I. The safety zones thus extend a total of 15,000 ft from each end of the runway; all zones are 3,000 ft wide. The Luke AFB runways and safety zones are illustrated in Figure 1.5-3, and land use constraints associated with the safety zones and noise contours are discussed in Section 3.4.5.

An AICUZ report for installations is made available to the general public and surrounding communities to use for informational purposes, although Arizona regulations must be used for planning purposes. The present Luke AFB AICUZ Report was updated in 1997. A new study will be prepared upon Air Force selection of one of the alternatives assessed in this EA, unless a waiver of such study is deemed appropriate.

3.1.4. Bird-Aircraft Strike Hazard

Flight operations over Luke AFB and its vicinity can be endangered by strikes involving migratory and resident bird species. A low but continual hazard of bird strikes exists due to the annual migration of various species, particularly raptors and small songbirds; concentrations of non-migratory birds; and the presence of waterfowl, which inhabit irrigation canals and the golf course pond. Bird strikes have occurred during all phases of flight; however, the greatest potential exists during low-level operations, and during takeoffs and landings.

The periods of greatest risk are generally during the spring and fall migrations, which range from March to May and mid-September to December, respectively. Luke AFB and the associated local flying areas are considered part of the Pacific Flyway. The major routes of the Pacific Flyway follow the coastline of the Pacific Ocean and adjacent bays, lakes, and marshes (USGS, 2001); however, a secondary route from the southern California coastal area to south Texas and northern Mexico passes through the Phoenix area (Beason, 2001).

The bird-aircraft strike hazard (BASH) program (which includes other types of wildlife in addition to birds) is governed by AFI 91-202, *The US Air Force Mishap Prevention Program*. A BASH plan is required for all Air Force installations supporting a flying mission. This plan provides guidance for reducing bird strike hazards in areas where flying operations are conducted, and is reviewed annually and updated as needed. The plan establishes provisions to disperse information of specific bird hazards and procedures for reporting hazardous bird activity. A Bird Hazard Working Group has been established to collect, compile, and review data on bird strikes. The Group identifies and recommends actions to reduce hazards, recommends changes in operational procedures, and prepares informational programs for aircrews. The 56 FW Safety Office maintains the Luke AFB BASH plan (USAF, 2001b).

According to the current plan, the Base Civil Engineer has proposed various base improvements and modifications to deter birds from inhabiting the airfield. Efforts to control vegetation, mowing, planting bare areas, filling low spots, removing possible perches, and eliminating plants with berries have all been considered. Water is controlled by modifying ditches, possibly covering culverts, and eliminating standing water that would attract waterfowl and other species. Waste, which attracts certain bird species (e.g., gulls), is controlled by rapid collection and disposal. Finally, various chemical and physical alterations are utilized, including bird-proofing buildings, towers, perches, etc.; controlling insects and rodents; and conducting periodic bird hazard assessments. Avitrol (4-aminopyridine, a bird poison) is used as needed to control populations of non-protected bird species (USAF, 2001b)

3.2. AIR RESOURCES

This section discusses the climate and meteorology of the area, regional air quality, and existing air pollutant sources.

3.2.1. Climate and Meteorology

Luke AFB is located in Deer Valley, near the northern edge of the Sonoran Desert, and has a hot and arid climate. The July mean maximum temperature is 106°Fahrenheit (F) and the January mean maximum temperature is 65°F. The mean minimum temperatures range from 42°F in December and January to 80°F in July. The area is subject to thunderstorms, but most produce little rainfall. Mean precipitation is about 8 inches per year. Most rain occurs from July through March, with peak rainfall (an average of 1.1 inches) occurring in August. Total annual potential evaporation is about 42 inches, causing a net annual precipitation (precipitation minus evaporation) deficit of 34 inches. Relative humidity ranges from about 52 percent in early morning to 24 percent in the early afternoon.

Prevailing winds are from the north from September through April, and from the southwest from May through August. Mean wind speeds range from 4 to 5 knots (5 to 6 miles per hour), with the highest speeds occurring from March through August (USAF, 2001c).

Deer Valley is surrounded by a series of short mountain ranges rising about 3,000 ft above the valley. This basin often experiences stagnant atmospheric conditions since there is little dispersion of pollutants (USAF, 2001c).

3.2.2. Regional Air Quality

The National Ambient Air Quality Standards, established by the United States Environmental Protection Agency (USEPA), define the maximum allowable concentrations of pollutants that may be reached but not exceeded within a given time period. These standards were selected to protect human health with a reasonable margin of safety. Exceeding the concentration levels within a given time period is a violation, and constitutes a nonattainment of the pollutant standard. The ADEQ administers the Arizona Ambient Air Quality Standards (AAAQS), which are adopted from the NAAQS.

Six criteria pollutants are regulated by the NAAQS: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and particulate matter. Particulate matter has been further defined by size. There are standards for particulate matter smaller

than 10 microns in diameter (PM_{10}) and smaller than 2.5 microns in diameter ($PM_{2.5}$). Table 3.2-1 presents the current NAAQS and AAAQS for the six criteria pollutants. The $PM_{2.5}$ standard is not yet being enforced. A 1999 federal court ruling blocked implementation of this standard, which the USEPA proposed in 1997. The USEPA has asked the U.S. Supreme Court to reconsider that decision (USEPA, 2001).

Table 3.2-1
National Ambient Air Quality Standards (NAAQS)
and Arizona Ambient Air Quality Standards (AAAQS)

Pollutant	Averaging Time	NAAQS µg/m³ (ppm)[a]		AAAQS µg/m³ (ppm)[a]
		Primary[b]	Secondary[c]	
O_3	1 hr	235 (0.12)	Same	Same
	8 hr	157 (0.08)	Same	None
CO	1 hr	40,000 (35)	None	Same
	8 hr	10,000 (9)	None	Same
NO_2	AAM[d]	100 (0.053)	Same	Same
SO_2	1 hr	None	None	None
	3 hr	None	1,300 (0.5)	Same
	24 hr	365 (0.14)	None	Same
	AAM	80 (0.03)	None	Same
PM_{10}	AAM	50	Same	Same
	24 hour	150	Same	Same
$PM_{2.5}$[e]	AAM	65	Same	None
	24 hr	15	Same	None
Pb	¼ year	1.5	Same	Same

[a] µg/m³ — micrograms per cubic meter; ppm — parts per million

[b] National Primary Standards establish the level of air quality necessary to protect the public health from any known or anticipated adverse effects of a pollutant, allowing a margin of safety to protect sensitive members of the population.

[c] National Secondary Standards establish the level of air quality necessary to protect the public welfare by preventing injury to agricultural crops and livestock, deterioration of materials and property, and adverse impacts on the environment.

[d] AAM —Annual Arithmetic Mean.

[e] The $PM_{2.5}$ standard is included for information only. A 1999 federal court ruling blocked implementation of this standard, which EPA proposed in 1997. EPA has asked the U.S. Supreme Court to reconsider that decision (USEPA, 2001).

PM_{10} is particulate matter equal to or less than 10 microns in diameter

$PM_{2.5}$ is particulate matter equal to or less than 2.5 microns in diameter

Source: 40 CFR 50; *Arizona Revised Statutes* Title 49, Chapter 3

Generally, criteria pollutants originate directly from mobile and stationary sources. Most O_3 forms as a result of volatile organic compounds (VOC) and nitrogen oxides (NO_x) reacting with sunlight. Although the NAAQS is based on NO_2 emissions, various NO_x compounds contribute to O_3 pollution. Consequently, total nitrogen oxides are measured when evaluating the potential risk of O_3 generation. In 1997, an eight-hour average standard of 0.08 parts per million (ppm) was adopted to replace a one-hour standard. The one-hour standard for ozone of 0.12 ppm was retained as a transition to the new eight-hour standard for those areas in nonattainment at the time. On June 5, 1998, the USEPA issued the final rule identifying areas where the one-hour NAAQS for ozone is no longer applicable because there had been no violation of the one-hour standard in such areas in the last three years.

For CO and SO_2, short-term standards may be exceeded once per year, but a violation would occur when a monitoring site records an exceedance twice per year. Violations of the O_3 and PM_{10} standards are calculated as an average over three years of data; the violation occurs when the number of exceedances, over a three-year period, averages out to more than one per year. The annual standards for NO_2, SO_2, and PM_{10}, as well as the quarterly standard for Pb, are considered to be violated for any single recorded exceedance. Once primary NAAQS have been violated three or more discontinuous times over three years in a given air quality control region, a status of "nonattainment" is applied.

Luke AFB is located in the Phoenix Metropolitan Area, which lies within the Maricopa Intrastate Air Quality Control Region (AQCR). The region is in attainment for NO_2, SO_2, and Pb, but is in serious nonattainment for O_3, CO, and PM_{10}.

The Maricopa Intrastate AQCR has met the O_3 standards for the last three years and is in the process of preparing a maintenance plan (Bauer, 2001). The area is still considered in nonattainment for O_3 until the plan is completed, submitted to USEPA, and approved.

Conformity thresholds, as defined in 40 CFR 51, Subpart W, are used to determine conformity of an action with a State Implementation Plan (SIP). A proposed Federal action is considered to conform to a SIP if the action does not: cause or contribute to any new violation of the NAAQS for any criteria air pollutant; increase the frequency or severity of any existing violation of any standard in the area; or delay timely attainment of any standard or required interim emissions reductions or milestones in any area. A nonattainment or maintenance area is only subject to thresholds for pollutants that are not in attainment. The conformity pollutant thresholds (also known as *de minimus* levels) designated "serious" are 100 tons per year (tpy) for CO; 50 tpy for O_3; and 70 tpy for PM_{10}. The O_3 threshold applies to amounts of NO_x and VOCs (neither can exceed 50 tpy).

Under the SIP, Luke AFB has been allocated an emissions budget for criteria pollutants. Conformity with the SIP is based on estimated emissions calculated up to the mixing height (a height above which mixing of pollutants from above ground sources and ground sources no longer occurs) of the atmosphere. The mixing height is 2,100 ft in the Maricopa Intrastate AQCR (USEPA, 2001).

The principal source of CO and SO_2 is combustion. The precursors of O_3 (VOC and NO_x) are also primarily emitted from combustion. Hazardous air pollutants (HAP) include a wide range of materials or chemicals that are toxic or potentially harmful to human health. While HAPs are found in numerous products and used in many processes (such as cleaning aircraft components), few types and small amounts of HAPs are generated during internal combustion processes. Activities during Luke AFB missions generate HAPs, but because the number of aircraft operations would not change as a result of implementing the Proposed Action or Implementation Alternative, HAPs are not considered further.

Luke AFB completed an Air Emissions Inventory for calendar year 2000 (USAF, 2000b). The inventory included emissions from equipment operation, fuel storage, hazardous material usage, and other stationary sources. The calculated amounts were 2.3 tpy of PM_{10}, 13.4 tpy of NO_x, 11.9 tpy of CO, 21.9 tpy of VOC, and 2.9 tpy of SO_2. Emissions from the operation of aircraft and aerospace ground equipment (AGE), as well as vehicular traffic, are not included because they are not reportable for calculation of emission fees to

Maricopa County. Lead emissions were not inventoried because the base does not, and has no potential to, generate lead emissions. The base has a CAA Title V Operating Permit from the Arizona Office of Air Quality. Prevention of Significant Deterioration (PSD) regulations apply to protection of areas where visibility is an important value, such as National Parks, but only apply to major stationary emission sources in specified geographic areas. Luke AFB is classified as a minor stationary source, as noted in the Title V Operating Permit. Therefore, the base is not subject to PSD review requirements of 40 CFR 52.21.

3.3. BIOLOGICAL RESOURCES

Biological resources include the native and introduced plants and animals that make up natural communities, which, in turn, are closely linked to the climate and topography of the area. Generally, the discussion of biological resources includes vegetation, wildlife, threatened or endangered species, and wetlands. However, since no construction, demolition, or ground activities would occur under the Proposed Action or any alternative action discussed in this EA, there would be no impact to vegetation, wildlife, or wetlands. Luke AFB has been implementing the flight changes described under the Proposed Action for the past year with no significant impacts to biological resources. No significant impacts to biological resources are anticipated if these temporary flight changes are made permanent. The following paragraphs discuss the threatened or endangered species that could potentially be affected by changes in flight operations.

3.3.1. Species Protection Categories

The U.S. Fish and Wildlife Service (USFWS) has the authority to list species of plants and animals as endangered or threatened for protection under the ESA. A listed species, provided protection under the ESA, is so designated because of danger of its extinction as a consequence of economic growth or development without adequate concern and conservation. An endangered species is any species of plant, fish, or wildlife that is in danger of extinction throughout all or a significant part of its range. A threatened species is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The USFWS lists species that are considered candidates for listing as threatened or endangered as Category 1 species. The USFWS no longer lists Category 2 species but requests that the presence of these formerly listed species be noted and taken into consideration when practicable. The State of Arizona considers state-endangered species to be those species or subspecies extirpated from Arizona since the mid-1800s and/or for which extinction or extirpation is highly probable unless conservation efforts are undertaken soon.

3.3.2. Protected Species in the Region

There are no federal threatened or endangered species or plant species known to occur on Luke AFB (USAF, 1997b). The ferruginous hawk (*Buteo regalis*) is a state-endangered species and prior federal Category 2 listed species that has been observed on the base. The burrowing owl (*Athene cunicularia*), a state-threatened species and former federal Category 2 listed species, has also been observed on base. There are three endangered bird species that have the potential to occur in the area of Luke AFB. The three species include

the Yuma clapper rail (*Rallus longirostris*), the American peregrine falcon (*Falco peregrinus anatum*), and the southwestern willow flycatcher (*Empidonax trailii extimus*) (USAF, 1997b). The Yavapai Arizona pocket mouse (*Perognathus amplus amplus*), a former Category 2 species, may also occur on base. Several bats designated for protection may occur in southern Arizona. The spotted bat (*euderma maculatum*) and California leaf-nosed bat (*macrotus californicus*) are former federal listed Category 2 and state listed candidate species, and the lesser long-nosed bat (*leptonycteris curasoae*) is a federally and state endangered species. These species are discussed in the following paragraphs.

The ferruginous hawk is a known winter transient in southern Arizona and on agricultural lands west of Phoenix. The hawks have been observed on and adjacent to the base during the winter in the open agricultural fields and mowed areas around the runways at Luke AFB, especially early in the fall and spring when populations of round-tailed ground squirrels are active. The probability of occurrence is moderate to high with good winter foraging habitat (USAF, 1997b).

The burrowing owl is classified as a former federal Category 2 species, but currently has no state status. Its habitat consists of deserts, grasslands, and barren or unplanted fields, especially where rodents are abundant. Burrowing owls nest in round-tailed ground squirrel burrows and other openings in the ground in the mowed area around the main runways at Luke AFB (USAF, 1997b). Between 45 to 50 burrowing owls (adult and juveniles) have been counted on several occasions in the vicinity of the runways (USAF, 1997b). The burrowing owl displays crepuscular foraging habits (primarily active during dawn and dusk) while pursuing large arthropods, small mammals, birds, and reptiles.

The Yuma clapper rail is known to occur in Arizona along the Colorado River in marsh habitat that has formed behind dams, and occasionally occurs in the Salt River marshes north of Phoenix and at the Pichacho Reservoir. This species is listed as federal and state endangered without determination of critical habitat. A designation of critical habitat refers to the designation of a physical area that contains habitat identified for protection as critical to the survival of the species. A designation of species without critical habitat refers to the lack of data supporting designation of a specific area as critical for survival of a species, but which may be designated in the future. The marsh habitat required by this species is not present on Luke AFB (USAF, 1997b).

The American peregrine falcon is known to occur on isolated cliff ledges throughout Arizona, but in small numbers (USAF, 1998b). Nest sites in Arizona are located in extensive mountain ranges or canyon systems usually near water where prey (passerine birds, waterfowl, and shore birds) is abundant. Falcons may travel up to 17 miles to hunting areas that often include cropland, meadows, river bottoms, marshes, and lakes, all of which attract abundant bird life (USAF, 1997b). The falcon is a transient along the lower Colorado River from September to late March and from May through August. The falcon is listed as federally endangered and a state candidate without determination of critical habitat. There is marginal foraging habitat on Luke AFB for the falcon, and the probability of occurrence is considered low (USAF, 1997b).

The southwestern willow flycatcher breeds locally in Arizona. Throughout its breeding range, this species is associated with dense riparian associations of willow cottonwood, buttonbush, and other deciduous trees and shrubs. This species is listed as federal and state

endangered with critical habitat. There is no suitable riparian habitat on Luke AFB for this species (USAF, 1997b).

The Yavapai Arizona pocket mouse is classified as a former federal Category 2 species, but currently has no state status. Its habitat is among mesquite or creosotes bush, cactus, or desert scrub that has a sparse perennial cover but does have some shrub cover. It is known to occur in Maricopa County and may occur at Luke AFB.

Very little is known of the habitat preferences or requirements of the spotted bats, but a study suggests that uneven, rocky cliffs within a mile or so of riparian habitats are preferred (USAF, 1997b). The spotted bats have been found near the Gila River, at Tempe, and along Beaver Dam Wash in northwestern Mohave County. While there appears little likelihood of this species occurring on Luke AFB, information on the species roost site selection, reproduction, and foraging preferences in Arizona is so poorly understood, it is not possible to evaluate the probability of their occurrence at Luke AFB (USAF, 1997b).

The California leaf-nosed bat is a fairly common, year-long resident of desert scrub habitats in southern Arizona, occurring north along the Colorado River to the northwestern corner of the state. In the summer, this bat species is present south of Luke AFB on the BMGR. These bats have a tropical origin and never developed the ability to hibernate in the winter, so must utilize winter roosts such as caves and mines where temperatures do not fall below 54°F (USAF, 1997b). There are no suitable roost or maternity sites known to occur on or in the vicinity of Luke AFB (USAF, 1997b).

The lesser long-nosed bat is present in southern Arizona (including the BMGR) during the summer months, but migrates south for the winter. Studies have identified several roosting sites (caves and mine tunnels) scattered through southwest Arizona , but all are located well to the south of Luke AFB (USFWS, 1997). No suitable foraging habitat for this nectar-feeding species exists on or in the immediate vicinity of Luke AFB (USAF, 1997b).

3.4. NOISE AND LAND USE

Noise is defined as any unwanted sound that interferes with normal activities or in some way reduces the quality of the environment. Ambient noise levels vary greatly in magnitude and character from one location to another, depending on the normal activities conducted in the area. Land use describes the current and planned use of land parcels in a particular area, constraints that affect land use, and factors that can affect land values. Noise and land use are discussed together in this analysis because the focus of the study is the potential change in aircraft operations that produce noise, which in turn affects land use and the populations within the affected areas.

3.4.1. Noise Descriptors

Community response to noise is not based on a single event, but on a series of events over the day. Factors that have been found to affect the subjective assessment of the daily noise environment include the noise levels of individual events, the number of events per day, and the time of day at which the events occur. Most environmental descriptors of noise are based on these three factors, although they may differ considerably in the manner in which

the factors are taken into account. Two types of noise measures are used in this document to describe aircraft noise impacts on an existing environment, the decibel and the day-night average sound level. These measures and their application to noise environments are discussed below.

The *decibel* (dB) is the physical unit commonly used to describe sound levels. Sound measurement is further refined by using an "A-weighted" decibel (dBA) scale that emphasizes the audio frequency response curve audible to the human ear. Thus, the dBA measurement more closely describes how a person perceives sound. For example, typical noise levels include: a quiet urban nighttime (40 dBA), an air conditioner operating 100 ft away (55 dBA), and a heavy truck moving 50 ft away (85 dBA). Table 3.4-1 shows noise levels for various human activities.

Scientific studies and social surveys conducted to measure community annoyance from all types of environmental noise have found the *day-night average sound level* (L_{dn}) descriptor to be the best measure of annoyance. The L_{dn} describes the 24-hour or daily noise environment by measuring single noise events using a dBA scale, with corrections added for the number of events and the time of day. A 10-dB penalty is added for noise that occurs between the hours of 10 p.m. and 7 a.m., because nighttime noise events are considered more annoying than noise occurring during daytime. The L_{dn} descriptor is accepted by federal agencies, including the Air Force, as a standard for estimating noise impact and establishing guidelines for compatible land uses. The L_{dn} is a measure of long-term noise environments and is applied to evaluating land uses compatible with particular noise levels. The contours shown in the figures within this EA, and analyzed for this study, are based on L_{dn} levels.

3.4.2. Existing Noise Conditions

Noise levels around most Air Force installations result primarily from aircraft operations at the base. This EA focuses on noise produced by aircraft during takeoff and landing operations. These noises fall within a broad range of "transient" noises, which come and go in a finite period of time. The maximum fly-over noise levels vary widely in magnitude, depending on the type of aircraft, type of operations, certain weather conditions, and distance from the observer to the aircraft. The noise can range from levels undetectable in the presence of other background noise, to levels sufficiently high to create feelings of annoyance or interfere with speech or sleep. The duration of the noise would also vary depending on the proximity of the aircraft, speed, and orientation with respect to the observer.

Most of the noise generated in the vicinity of Luke AFB is from aircraft operations (nearly 127,800 total operations per year; see Table 3.1-1) (USAF, 2001a). The aircraft noises fall within a broad range of "transient" noises, which come and go in a finite period of time. Currently, aircraft operating at Luke AFB are primarily F-16 fighter aircraft, with some transient and deployed aircraft of other types (see Section 3.1.1, Table 3.1-1).

Table 3.4-1
Typical Decibel Levels Encountered in the Environment and Industry

Sound Level (dBA)	Maximum Exposure Limits	Source of Noise	Subjective Impression
10			Threshold of hearing
20		Still recording studio; Rustling leaves	
30		Quiet bedroom	
35		Soft whisper at 5 ft; Typical library	
40		Quiet urban setting (nighttime); Normal level in home	Threshold of quiet
45		Large transformer at 200 ft	
50		Private business office; Light traffic at 100 ft; Quiet urban setting (daytime)	
55		Window air conditioner; Men's clothing department in store	Desirable limit for outdoor residential area use (EPA)
60		Conversational speech; Data processing center	
65		Busy restaurant; Automobile at 100 ft	Acceptable level for residential land use
70		Vacuum cleaner in home; Freight train at 100 ft	Threshold of moderately loud
75		Freeway at 10 ft	
80		Ringing alarm clock at 2 ft; Kitchen garbage disposal; Loud orchestral music in large room	Most residents annoyed
85		Average street traffic at 50 ft, printing press; Boiler room; Heavy truck at 50 ft	Threshold of hearing damage for prolonged exposure
90	8 hr	Heavy city traffic	
95	4 hr	Freight train at 50 ft; Home lawn mower	
100	2 hr	Pile driver at 50 ft; Heavy diesel equipment at 25 ft	Threshold of very loud
105	1 hr	Banging on steel plate; Air hammer	
110	0.5 hr	Rock music concert; Turbine condenser	
115	0.25 hr	Jet plane overhead at 500 ft	
120	< 0.25 hr	Jet plane taking off at 200 ft	Threshold of pain
135	< 0.25 hr	Civil defense siren at 100 ft	Threshold of extremely loud

Source: U.S. Army, 1978; MPCA, 2001; FHWA, 2001

Luke AFB takes measures to reduce environmental noise by utilizing the operational procedures outlined in AFI 13-201 (*U.S. Air Force Airspace Management*) and maintaining an effective program for receiving, documenting, and responding to noise-related issues and complaints regarding aircraft operated by the 56 FW. Procedures have been standardized for handling noise complaints through the Public Affairs Office (56 FW/PA) at Luke AFB.

Of the approximately 450 daily operations at Luke AFB, 96 percent occur from 7 a.m. to 10 p.m., with the remaining 4 percent occurring during the nighttime hours of 10 p.m. to 7 a.m. Aircraft operations generate high noise levels, which can result in public complaints. The 56 FW/PA received about 60 noise complaints in the last year, primarily to the northeast and east of Luke AFB (USAF, 2001f).

3.4.3. Noise Sensitive Receptors

A noise sensitive receptor is commonly defined as the occupants of any facility where a state of quietness is a basis for use, such as a residence, hospital, or church. The closest on-base sensitive receptors to the Luke AFB airfield are Fowler Park and Luke Elementary School, both located within the family housing area east of the Main Gate. The nearest off-base sensitive receptor is Dysart High School in El Mirage. Sensitive receptor locations in the vicinity of Luke AFB are shown on Figure 3.4-1, along with other locations that were selected to show noise levels in areas to the south and southwest of the base. Table 3.4-2 shows the day-night average sound levels (in decibels) for these locations.

3.4.4. Land Use Categories

Luke AFB is situated in an area known locally as the West Valley, which consists of a mixture of fast-growing suburban communities, agricultural land, and open space. Land use maps developed by local communities and the Maricopa Association of Governments (MAG) define a range of land use categories (MAG, 2001; Surprise, 2001; El Mirage, 2002; and Goodyear, 2001). For the purposes of this EA, eight land use categories are defined and listed below:

- **Residential (R).** Includes all types of residential use, such as single and multifamily residences, at unit densities of greater than one per acre.
- **Low-density Residential (LR).** Residential development equal to or less than one dwelling per acre. (The property size generally ranges from one to four acres.)
- **Commercial (C).** Wholesale or retail establishments, including offices, stores, restaurants, and hotels and motels.
- **Industrial (I).** Manufacturing, warehouses, and other similar uses.
- **Public (P).** Publicly owned lands and lands open to public access, including military reservations, prisons, public buildings, schools, churches, cemeteries, and hospitals.
- **Recreation (Rec).** Land designated for recreational activity, including parks, golf courses, and wildlife and nature areas.
- **Open.** Undeveloped land.
- **Agricultural and Resource Extraction.** Land used for agricultural activities such as crops, grazing, and livestock production. This land use includes single-family residences located within an agricultural parcel that serve as the primary residence for persons engaging in agricultural production. Resource extraction includes such activities as mining or quarrying.

Land use is further categorized as off-base and on-base. For the purposes of this analysis, the area of Luke AFB is defined as the area shown in the Luke General Plan (USAF, 2001e), including the golf course and diversion basin north of Northern Avenue, comprising a total area of about 2,800 acres. On-base land use is divided into only two categories, public and residential. The public category encompasses all land uses that are not residential, while the residential category includes both the dormitory areas on base and the family housing area east of Litchfield Road.

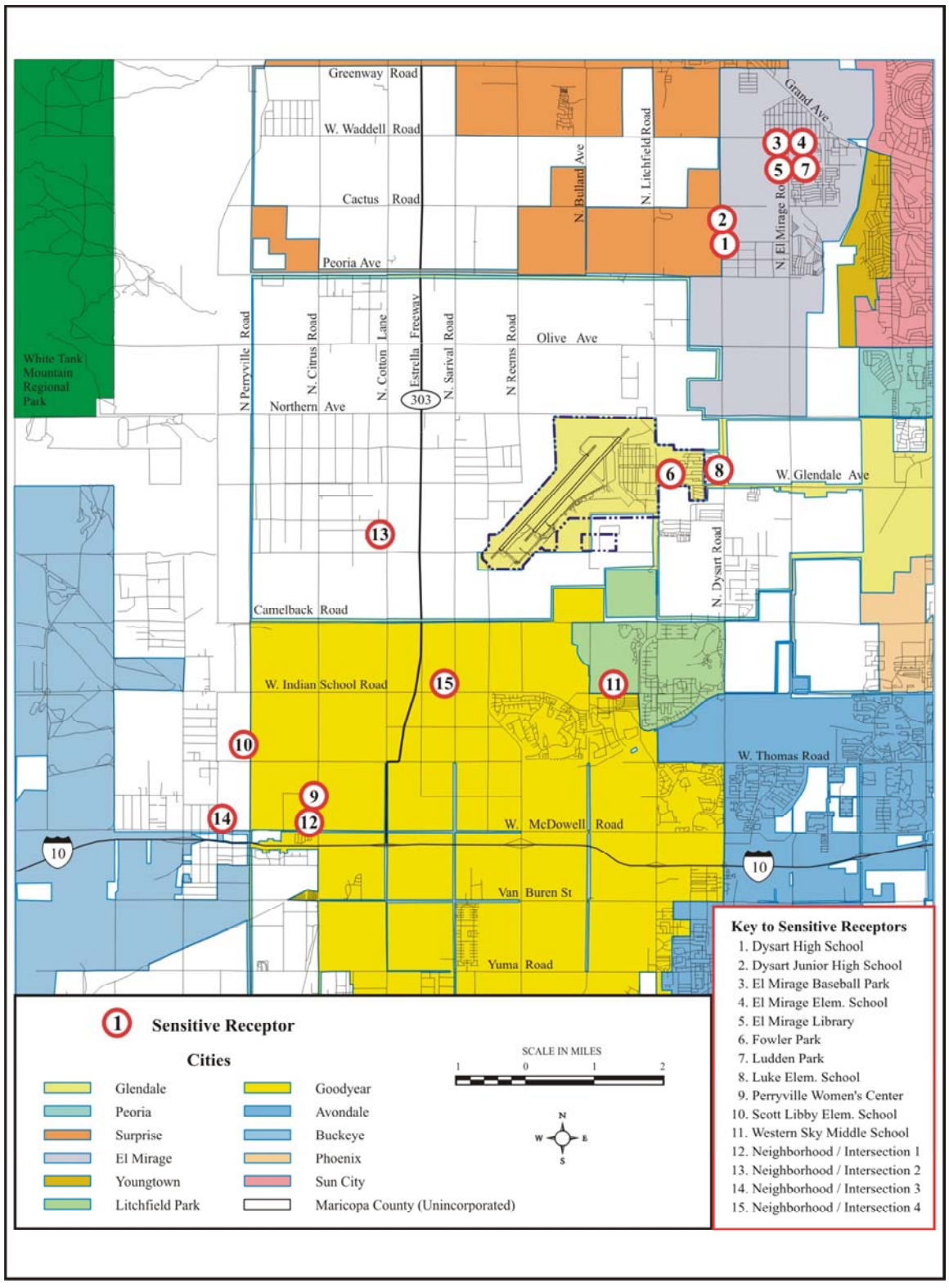

Figure 3.4-1. Potential Noise Receptor and Other Locations

Table 3.4-2.
Baseline Noise Levels at Sensitive Receptor and Other Locations in the Vicinity of Luke AFB

Name	*Location with Latitude and Longitude*	*Noise Level in Decibels* L_{dn}
Dysart High School	N. Dysart Road and Varney Road, El Mirage Lat 33°35.286'N., Long 112°20.433'W.	66.19
Dysart Junior High School	11405 N. Dysart Road, El Mirage Lat 33°35.603'N., Long 112°20.500'W.	63.91
El Mirage Baseball Park	W. Waddell Road and N. El Mirage Road, El Mirage Lat 33°36.552'N., Long 112°19.493'W.	65.30
El Mirage Elem. School	12308 W. Waddell Road, El Mirage Lat 33°36.546'N., Long 112°19.500'W.	65.29
El Mirage Library	El Mirage Road and W. Ventura Street, El Mirage Lat 33°36.649'N., Long 112°19.496'W.	64.72
Fowler Park	Northeast of N. Litchfield Road and W. Glendale Avenue, Glendale Lat 33°32.478'N., Long 112°20.174'W.	61.13
Ludden Park	N. Capistrano Drive and W. Waddell Road, El Mirage Lat 33°36.519'N., Long 112°19.496'W.	65.46
Luke Elem. School	W. Thunderbird Street and Navajo Circle, Glendale Lat 33°32.413'N., Long 112°20.525'W.	63.13
Perryville Women's Center	Northwest of N. Citrus Road and W. McDowell Road, Goodyear Lat 33°28.176'N., Long 112°26.824'W.	60.45
Scott Libby Elem. School	18706 W. Thomas Road, Maricopa County Lat 33°28.718'N., Long 112°27.728'W.	56.10
Western Sky Middle School	4095 N. 144th Avenue, Litchfield Park Lat 33°29.589'N., Long 112°22.108'W.	50.56
Neighborhood / Intersection 1	Intersection of N. 181st Avenue and W. Lynwood Street, Goodyear Lat 33°27.854'N., Long 112°26.913'W.	57.95
Neighborhood / Intersection 2	Immediately W. of Intersection of W. Rose Lane/ Claremont and N. Cotton Lane, Maricopa County Lat 33°31.587'N., Long 112°25.692'W.	65.41
Neighborhood / Intersection 3	Intersection of N. 191st Ave and W. McDowell Road, unincorp. Maricopa County / Buckeye Lat 33°27.882'N., Long 112°28.215'W.	56.87
Neighborhood / Intersection 4	Intersection of N. Sarival Road and W. Indian School Road, Goodyear Lat 33°29.620'N., Long 112°24.570'W.	62.39

3.4.5. Noise-based Constraints on Land Use

In 1979, the Federal Interagency Committee on Urban Noise (FICUN) was formed to develop Federal policy and guidance on noise. The committee's membership included the USEPA, the FAA, the Federal Highway Administration, the DoD, the Department of Housing and Urban Development, and the Department of Veterans Affairs. The designations contained in the FICUN's land use compatibility table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities.

In Arizona, noise-based constraints on land use are regulated by Arizona state law and local zoning ordinances. The Arizona Revised Statutes were amended in July 2001 to include provisions for regulating the effects of noise generated by aircraft in the vicinity of a military airport. These regulations are based on noise guidelines defined by the FICUN for considering noise in land use planning, but include special considerations for land use within a territory in the vicinity of a military airport. The FICUN Guidelines and state regulations are summarized below (consult the *Arizona Revised Statutes* for the complete state regulations).

3.4.5.1. Federal Interagency Committee on Urban Noise Guidelines

The FICUN guidelines consider areas with noise levels of 75 L_{dn} or greater as unacceptable living environments. Areas between 65-74 L_{dn} are recommended as "generally unacceptable" for noise-sensitive land uses such as residences, schools, hospitals, and public services. Houses located in areas between 65-74 L_{dn} may not qualify for federal mortgage insurance without additional costs associated with installing noise attenuation. In the outdoor noise environment, levels greater than 65 L_{dn} may be annoying to some people during communications. Generally, residential development is not recommended in areas experiencing noise levels of 65 dBA or greater. Although discouraged, residential development is compatible within the 65-69 dBA and 70-74 dBA contours, provided noise reduction levels of 25 dB and 30 dB, respectively, are achieved.

Commercial/retail businesses are a compatible land use without restrictions up to 69 dBA, and up to 79 dBA provided that noise reduction levels of 25-30 dB are achieved for public areas. Industrial/manufacturing, transportation, and utility companies have a high noise level compatibility, and therefore can be located within the higher noise zones.

3.4.5.2. Arizona Regulations

A.R.S. Sec. 28-8461 defines a "territory in the vicinity of military airports," in which the law requires disclosure to property owners that they are within the territory of a military airport, and the noise attenuation required for structures within the 65 decibel (dB) noise contour applies to the entire area. In the case of Luke AFB, the territory is defined as 10 miles from the center of the runway to the north, west, and south, and 4 miles to the east (see Figure 1.5-2). Within this territory, land use restrictions apply only within the 65 dB contour established by the 1988 Joint Land Use Study. The noise contours from this study were codified into law by the Arizona Legislature in 1995 (A.R.S Sec. 28-8462), stabilizing the area within which noise level-based land use restrictions occur.

Although the JLUS contour was derived from a previous set of noise contours under which the predominant direction of operations was to the northeast, the JLUS contour remains valid because the broader protection it affords would accommodate future mission changes at Luke AFB. Possible mission changes are unknown at this time, but it is reasonable to expect that these will occur as a result of changing geopolitical situations, advances in technology, and shifting priorities within the DoD and the Air Force. Figure 3.4-2. shows current land use in the vicinity of the noise contours, along with the 65 dB contours for the JLUS and the No Action Alternative (baseline).

A.R.S. Sec 28-8481 requires that political subdivisions with territory in the vicinity of a military airport shall do the following:

- Adopt land use plans and adopt and enforce zoning regulations to assure development compatible with the high noise and accident potential generated by military airport operations that have or may have an adverse effect on public health and safety.
- Incorporate sound attenuation standards into any building code in existence on or adopted after July 1, 2001 for all development on property on which the day-night average sound level is 65 dB or higher.

The land use provisions promulgated in A.R.S. Sec. 28-8481 include the following constraints:

- **Residential.** New residential structures or expansions of existing residential structures are banned within the 65 L_{dn} or greater contours, *except for*:
  - Single-family residential dwellings at a density of one dwelling per acre or less (permitted up to 79 L_{dn}), which are the subject of zoning approved on or before December 31, 2000, or
  - Single-family residential dwellings that are the primary residence for people engaged in agriculture (permitted up to 84 L_{dn}); these are referred to as agricultural residences.
- **Commercial.** New construction or expansion of existing structures are allowed for most commercial land uses up to 79 L_{dn}. Exceptions are wholesale trade, building materials, and repair establishments, which are allowed up to 84 L_{dn}.
- **Industrial.** New construction or expansion of existing structures are allowed for industrial land uses up to 84 L_{dn}. Noise reduction must be incorporated for noise-sensitive areas, such as offices.
- **Public/Quasi-Public.** Public, medical and health, nonprofit organizations, and other public uses are limited to 74 L_{dn}. Correction facilities and cemeteries are allowed up to 79 L_{dn}.
- **Recreational.** The restrictions on new land use for recreational uses vary between 74 and 79 L_{dn}, depending on the type of use.
- **Agricultural.** Agricultural land use is not restricted by noise levels.

The A.R.S. Sec. 28-8482 requires that political subdivisions with territory in the vicinity of a military airport incorporate the prescribed sound attenuation standards and specifications into any building code in existence on or adopted after July 1995; these will apply to new development and alterations located on property on which the day-night average sound level is 65 dB or higher. The regulation further requires that a political subdivision with territory in the vicinity of a military airport on which the day-night average sound level is 65 dB or higher shall adopt an ordinance that requires a noise level reduction to be incorporated in the design and construction of any building to achieve a maximum interior noise level of 45 dB. However, the sound attenuation requirements of this section do not apply to ancillary buildings used in agricultural land use.

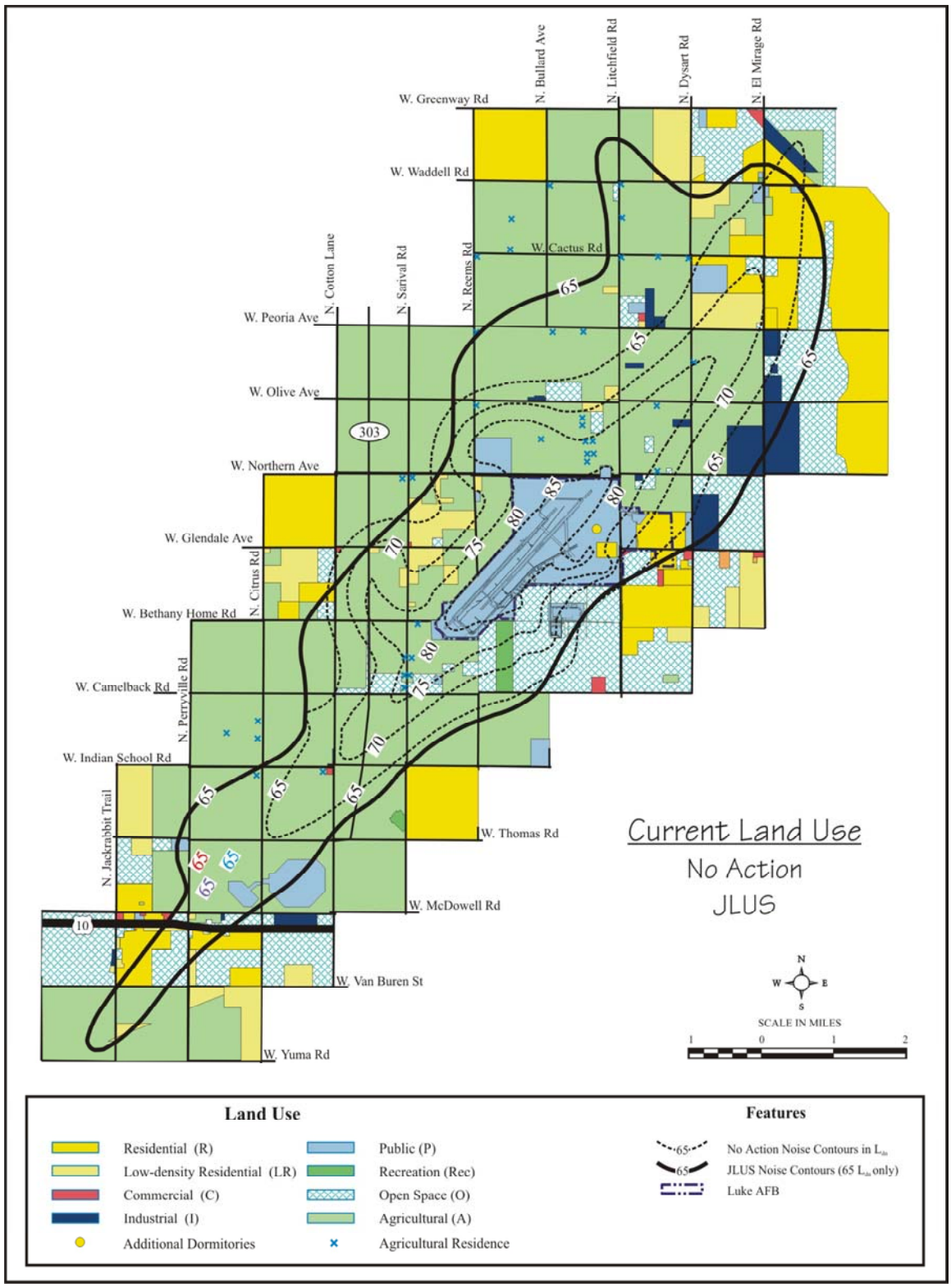

Figure 3.4-2. Land Use Under No Action Contours, Compared to JLUS

The A.R.S. Sec. 28-8483 requires that the state real estate department and political subdivisions with territory in the vicinity of a military airport shall request information from military airports in the state, including maps of military flight operations and a list of contact persons at each military airport who are knowledgeable about the impacts of military flight operations.

The information shall be available to the public on request and shall be used to enforce the sound attenuation and public disclosure requirements of A.R.S. Sections 28-8481 and 28-8482. This EA, and the AICUZ Study that follows it, will assist state and local planners in their compliance with these state regulations.

3.4.6. Current Land Use

Noise levels affect potential land uses, as discussed in Section 3.4.5. Noise contours developed for the JLUS and through the AICUZ Program at Luke AFB have been plotted on land use maps and provide a graphic depiction of the relationship between noise levels and land uses. The area of various land uses within the JLUS and AICUZ contours is calculated using a methodology described in Section 4.4.2. Table 3.4-3 shows the amount of land according to land use within the 65 L_{dn} for the JLUS contour, and within the 65 L_{dn} and greater contours for the No Action Alternative. The table also shows the total land area within the ten affected census tracts (1,215,347 acres) and the percentage that falls under each noise contour, by land use category. Following the table is a discussion of the data derived from the analysis of existing contours and land uses.

3.4.4.1. Land Use Within Noise Contours

JLUS Noise Contour. About 22,300 acres (34.84 square miles) are within the JLUS 65 L_{dn} contour (see Figure 3.4-2). Within the JLUS contour, about 19,700 acres (89 percent) is off-base, with the remainder on-base. About 72 percent of the off-base land is agricultural, with approximately 11 percent open space, 4 percent low-density residential, and 7 percent residential. Industrial, recreational, public, and commercial land use make up the remaining 6 percent of the land use.

Off-base residential land use affected by 65 or greater L_{dn} noise levels is located in El Mirage, and in unincorporated areas near Glendale, Goodyear, and Buckeye. Affected low-density residential is located in or near El Mirage, Surprise, and in unincorporated areas near Glendale, Buckeye, and Goodyear. Industrial and public land use within 65 or greater L_{dn} noise levels is located in or near El Mirage, Glendale, Surprise, and Goodyear. The affected commercial areas are located in or near El Mirage, Buckeye, and unincorporated areas near Glendale, Surprise, and Goodyear.

No Action Alternative (Baseline). An AICUZ study for Luke AFB was completed in 1995 (revised in 1997) and serves as the baseline of existing conditions, which represent the No Action Alternative. The resulting contours and land use are shown in Figure 3.4-2. The total amount of land affected by existing aircraft operations is approximately 14,550 acres (22.74 square miles), all within Maricopa County. Table 3.4-3 shows the amount of land within the 65 L_{dn} and greater contours according to land use for the No Action Alternative (baseline conditions).

Table 3.4-3
Existing Land Use Impacts (in Acres), by Land Use Category and Noise Level[1]

Total land area of the ten affected census tracts (CT): 1,215,347 acres

	LR	*R*	*C*	*I*	*Ag*	*Rec*	*O*	*P*	*Total*
JLUS[2,3]									
On-base[3,4]									
65+		271.5						2,272.6	2,544.1
% of Total	*N/A*	*18.8%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*85.5%*	*11.4%*
Off-base									
65+	992.9	1,176.2	20.2	617.3	14,169.1	152.5	2,259.5	385.3	19,773.0
% of Total	*100.0%*	*81.2%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*14.5%*	*88.6%*
Total[5]	**992.9**	**1,447.8**	**20.2**	**617.3**	**14,169.1**	**152.5**	**2,259.5**	**2,657.9**	**22,317.6**
% of Total Area of Affected CTs[6]	*0.08%*	*0.12%*	*0.00%*	*0.05%*	*1.17%*	*0.01%*	*0.19%*	*0.22%*	*1.84%*
No Action Alternative[3]									
On-base[3,4]									
65-69		161.1						102.4	263.5
70-74		34.3						220.4	254.6
75-79		12.1						354.8	366.9
80-84		14.3						504.2	518.5
85+		-						1,047.8	1,047.8
Total On-base[5]		**221.8**						**2,229.5**	**2,451.3**
% of Total	*N/A*	*31.8%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*91.9%*	*16.8%*
Off-base[3]									
65-69	798.7	398.9	23.6	133.4	3,814.9	48.7	686.6	179.6	6,084.4
70-74	337.7	77.0	2.3	10.7	2,709.2	54.9	440.5	7.4	3,639.7
75-79	23.5	-	-	12.1	1,531.9	37.0	241.3	10.8	1,856.6
80-84	15.5	-	-	-	425.1	3.3	61.4	-	505.3
85+	-	-	-	-	9.2	-	7.9	-	17.1
Total Off-base[5]	**1,175.4**	**476.0**	**25.9**	**156.2**	**8,490.3**	**143.9**	**1,437.7**	**197.7**	**12,103.1**
% of Total	*100.0%*	*68.2%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*8.1%*	*83.2%*
TOTAL[5]	**1,175.4**	**697.8**	**25.9**	**156.2**	**8,490.3**	**143.9**	**1,437.7**	**2,427.3**	**14,554.4**
% of Total Area of Affected CTs[6]	*0.10%*	0.06%	*0.00%*	*0.01%*	*0.70%*	*0.01%*	*0.12%*	*0.20%*	*1.20%*

[1]Land use categories:

LR	Low-density Residential	C	Commercial	Ag	Agricultural	O	Open Space
R	Residential	I	Industrial	Rec	Recreational	P	Public

[2]The JLUS includes all noise levels at 65 L_{dn} and above.

[3]All noise levels are in L_{dn}.

[4]On-base contains only the residential and public land use categories. "Residential" includes family housing and dormitories; all on-base non-residential land is categorized as "public."

[5]Numbers may not add due to rounding.

[6]CT = census tract. This percentage was calculated by dividing the affected area under the contour by the total land area of the 10 affected census tracts (1,215,347 acres).

Source (Census data): USBC, 1990 and 2000.

On-base land use includes only two categories, residential (9 percent) and the public category, which includes all non-residential uses (91 percent). Residential includes both family housing areas and dormitories. About 17 percent of the land impacted by 65 L_{dn} and greater is on-base, with the remaining 83 percent off-base.

Of the total affected lands under the contours, about 58 percent is agricultural, 17 percent is public, 10 percent is open space, 8 percent low-density residential, and 5 percent is residential, and the remaining 2 percent is spread among various land uses.

Four percent of the affected off-base land use is residential; of this amount (less than 500 acres), about 84 percent is within 65 to 69 L_{dn} and 16 percent within 70 to 74 L_{dn}. Low-density residential makes up about 10 percent of the off-base affected land use, and is exposed to higher noise levels: about 68 percent within 65 to 69 L_{dn}, about 29 percent within 70 to 74; about 2 percent with 75-79 $L_{dn,}$ and the remaining 1 percent above 80 L_{dn}. Recreation, public, industrial, and commercial land uses account for five percent of the affected off-base acreage.

All of the off-base residential land use affected by 65 or greater L_{dn} is in El Mirage and unincorporated areas near Glendale. Affected low-density residential is in or near El Mirage or in unincorporated areas near Glendale. Industrial and public land use in 65 or greater L_{dn} is located in or near El Mirage, Surprise, or in unincorporated areas near Glendale. The affected commercial area is located in unincorporated areas near Glendale and Goodyear.

3.4.6.3. Population Within Noise Contours

Table 3.4-4 shows the estimated population affected by noise levels of 65 L_{dn} and greater within the JLUS and baseline (No Action) contours. The methodology for determining the affected population is discussed in Section 4.4.2.

JLUS Noise Contour. There are about 9,620 people residing within the 65 L_{dn} JLUS contour. About 37 percent (3,525 people) of the total affected population within the 65 L_{dn} JLUS contour is on-base, with 63 percent (6,092 people) of the affected population residing off-base. Of the affected off-base population, about 68 percent reside in El Mirage (and adjacent unincorporated county), 21 percent in Glendale (and adjacent unincorporated county), 6 percent in Buckeye (and adjacent unincorporated county), 4 percent in Goodyear (and adjacent unincorporated county), and about 1 percent in Surprise (and adjacent unincorporated county).

No Action Alternative. There are about 8,054 people residing within the baseline contours, with noise levels above 65 L_{dn}. About 30 percent of the total affected population within the 65 L_{dn} and above baseline contours is on-base, with 70 percent of the affected population residing off-base.

Of the affected off-base population, about 83 percent reside in El Mirage and adjacent unincorporated county, with 16 percent in Glendale and adjacent unincorporated county, and less than 1 percent in Surprise and Glendale and adjacent unincorporated county.

Table 3.4-4
Existing Noise Impacts to Population

Total population of the 10 affected census tracts[1]: 54,799

	Affected Population	*Percent of Total Census Tract Population*	*Affected Population*	*Percent of Total Census Tract Population*
On-base[2]				
Noise Level	**JLUS[3]**		**No Action**	
65-69	3,525	*6%*	1,385	*3%*
70-74		*0%*	641	*1%*
75-79		*0%*	241	*0%*
80-84		*0%*	164	*0%*
85+		*0%*	0	*0%*
Total	**3,525**	***6%***	**2,431**	***4%***
Off-base[2]				
Noise Level	**JLUS[3]**		**No Action**	
65-69	6,092	*11%*	4,979	*9%*
70-74		*0%*	511	*1%*
75-79		*0%*	88	*0%*
80-84		*0%*	45	*0%*
85+		*0%*	0	*0%*
Total	**6,092**	***11%***	**5,623**	***10%***
Total[2]				
Noise Level	**JLUS[3]**		**No Action**	
65-69	9,617	*18%*	6,364	*12%*
70-74		*0%*	1,152	*2%*
75-79		*0%*	329	*1%*
80-84		*0%*	209	*0%*
85+		*0%*		*0%*
Total	**9,617**	***18%***	**8,054**	***15%***

[1]Total population is 54,799 for the 10 affected census tracts that lie (at least in part) under the JLUS contour.
[2]All noise levels are in L_{dn}.
[3]The JLUS contour includes all noise levels above 65L_{dn}, not only 65-69 L_{dn}.

Source: USBC, 2000; NOISEMAP 6.5.

About 87 percent of the population affected by the noise levels between 65 and 69 L_{dn} (an estimated 4,979 people) reside in El Mirage, with about 12 percent in Glendale and adjacent unincorporated county, and less than 1 percent in Surprise and Goodyear. Of the population affected by noise levels between 70 and 74 L_{dn} (only about 511 people), 67 percent reside in El Mirage, 32 percent in Glendale, and 1 percent in Goodyear (see Tables B-1 through B-5).

Fewer than 90 persons are affected by noise levels between 75 and 79 L_{dn}; of these, 94 percent reside in Glendale (and adjacent unincorporated county), and 6 percent in El Mirage. All of the estimated 45 people affected by noise levels between 80 and 84 L_{dn} reside in an unincorporated area near Glendale. There are no residents in areas of 85 or greater L_{dn}.

3.5. SOCIOECONOMICS

Only population and income measures are described in the Socioeconomics section. No personnel would relocate permanently to the Luke AFB area as part of the Proposed Action or any alternative, and no construction is involved in any alternative considered in this EA. The student pilots, whose numbers would increase slightly under the Proposed Action or the Implementation Alternative, are housed on base during their training sessions, and so would not affect the off-base housing market. Their families do not accompany them, so there would be no impacts to local schools and other services. The socioeconomic impacts of any action are expected to be confined primarily to the economic effects of land use changes that could result from the changes in flight operations.

Therefore, the socioeconomic resource areas that can be affected by an influx of personnel—employment, schools, and government services—will not be discussed in this document. Population trends and income measures are discussed to provide a context within which to understand the growth occurring in the area. The latest available data are used; population data are from the 2000 Census (USBC, 2000), while income data are from the 1990 Census (USBC, 1990)(see Section 3.5.3).

3.5.1. Location and Region of Influence

Luke AFB is located in Glendale, AZ, in the western portion of the Phoenix metro area. The Phoenix metro area lies in a physiographic basin known locally as the Valley of the Sun, and the area surrounding Luke AFB is known as the West Valley. Figure 1.5-1 shows the vicinity of Luke AFB. In addition to Glendale, nearby West Valley towns are Peoria, Surprise, El Mirage, Youngtown, Litchfield Park, Goodyear, Avondale, and Buckeye. Maricopa County comprises the Phoenix-Mesa Metropolitan Statistical Area (MSA).

The socioeconomic region of influence (ROI) for an analysis of this type is generally defined by the residence patterns of current installation personnel, the number of incoming personnel associated with the action under consideration, and the value of any construction associated with the action. As mentioned above, no construction personnel, or changes to permanent personnel at Luke AFB, are associated with the action under consideration. Potential socioeconomic impacts would be related to the noise contours associated with the alternatives under consideration in this EA; all contours lie entirely within Maricopa County, specifically within the West Valley area that surrounds the base. Therefore, the ROI is defined as the portion of Maricopa County's West Valley that makes up the nine municipalities of Glendale, Peoria, Surprise, El Mirage, Youngtown, Litchfield Park, Goodyear, Avondale, and Buckeye; and the unincorporated portions of Maricopa County that lie between incorporated areas and under the contours. The ROI is shown in Figure 1.5-2.

3.5.2. Population

Maricopa County and the State of Arizona have experienced dramatic growth during each decade since their settlement in the Nineteenth Century. In the 1880 Census, the first held after the county's incorporation in 1871, Arizona had fewer than 40,500 residents and Maricopa County had fewer than 5,700 residents, less than 14 percent of the state total. By

1940, the year Luke Field was established, Arizona had more than 499,000 residents, while Maricopa County had more than 186,000 residents, 37 percent of the state's population. In 1970, the county population of 971,000 was 55 percent of the state's 1.8 million. Since then, both areas have seen their populations approximately triple. The 2000 Census counted 3.1 million residents in Maricopa County, representing 60 percent of the total state population of 5.1 million (USBC, 2001).

The West Valley communities surrounding the base have seen strong growth as well. Only Glendale (1929) and Buckeye (1910) were incorporated before Luke's establishment. Glendale's 1920 population of 2,700 has increased every decade, with the strongest growth in the 1950s, 1960s, and 1970s; its population in 2000 was 218,812. Buckeye's growth has been more modest but still strongly positive, with strongest growth occurring in the 1950s and the 1990s. Generally, the younger towns in the area have also experienced high growth rates, as shown in Figure 3.5-1. While some of the towns' growth can be attributed to annexations, most of it results from an influx of people into the area, drawn by the "Sunbelt" climate, the growth of the region as a retirement center, and the expanding economy.

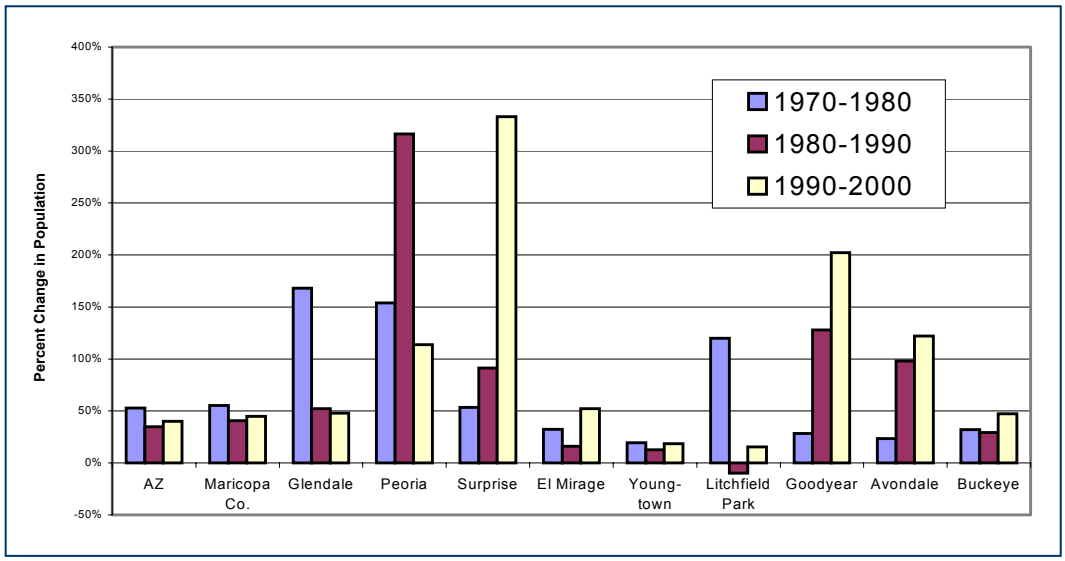

Figure 3.5-1. Percent Change in Population from Previous Decade, 1970-2000

3.5.3. Income Characteristics

This section provides three income measures for the nine communities and the comparison areas of Maricopa County, Arizona, and the United States, as shown in Table 3.5-1. The U.S. Bureau of the Census (USBC) has not yet released Census 2000 income and poverty data for counties and sub-county units (towns, census tracts, etc.), and comparable and reliable inter-census data generally are not available at the sub-county level. For this reason, it is necessary to use data from the 1990 Census. While these measures provide a means to compare the nine communities (as of 1990), it is likely that the relative income positions of the communities may have shifted during the 1990s, a decade of rapid expansion in the West Valley, both demographically and economically.

Table 3.5-1 shows that income varies widely among the various communities. Per capita income (PCI) is the "average" income, calculated by dividing the total income for an area by that area's total population. A median value is the mid-point of a ranked list of values. Households consist of individuals occupying the same housing unit, while families include the householder and everyone living in that housing unit who is related to the householder. (Individuals living in group quarters (e.g., correctional facilities, college dormitories, or military barracks) are not counted in households or families.)

Table 3.5-1
Income Measures of Affected and Comparison Areas, U.S. Census 1990

Place	*Median Household Income*	*Median Family Income*	*Per Capita Income*
United States	$30,056	$35,225	$14,420
Arizona	$27,540	$32,178	$13,461
% of U.S.	*92%*	*91%*	*93%*
Maricopa County	$30,797	$36,078	$14,970
% of U.S.	*102%*	*102%*	*104%*
Towns			
Glendale	$31,665	$37,086	$13,524
% of U.S.	*105%*	*105%*	*94%*
Peoria	$34,205	$38,177	$14,059
% of U.S.	*114%*	*108%*	*97%*
Surprise	$21,750	$23,595	$8,160
% of U.S.	*72%*	*67%*	*57%*
El Mirage	$20,372	$21,717	$5,947
% of U.S.	*68%*	*62%*	*41%*
Youngtown	$15,819	$21,473	$10,924
% of U.S.	*53%*	*61%*	*76%*
Litchfield Park	$57,563	$61,901	$25,711
% of U.S.	*192%*	*176%*	*178%*
Goodyear	$32,708	$35,055	$11,029
% of U.S.	*109%*	*100%*	*76%*
Avondale	$24,292	$26,520	$8,990
% of U.S.	*81%*	*75%*	*62%*
Buckeye	$24,896	$29,978	$9,570
% of U.S.	*83%*	*85%*	*66%*
Phoenix (city)	$29,291	$34,172	$14,096
% of U.S.	*97%*	*97%*	*98%*

Source: USBC, 1990.

Median household income near Luke AFB ranges from $57,563 (192 percent of U.S.) to $15,819 (53 percent), while family household income ranges from $61,901 (176 percent of U.S.) to $21,473 (61 percent). For both measures, Litchfield Park is the highest and Youngtown is the lowest. Again, median income values will be affected by variations in labor force participation rates among communities.

3.6. ENVIRONMENTAL JUSTICE

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was signed by the President on February 11, 1994. This EO requires that each federal agency identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The EO also requires that minority and low-income populations be given access to information and opportunities to provide input to decision-making on federal actions.

In order to evaluate any potential effects, demographic data on minority and low-income populations are provided in this section.

The terms "low-income" and "minority" are defined according to guidance published by the Air Force Center for Environmental Excellence (AFCEE). Under this guidance, "low-income" is defined as persons below the poverty level. The poverty threshold, which is a function of family size and is adjusted over time to account for inflation, was designated by the federal government as $17,524 for a family of four in 2000 and as $13,301 in 1990. "Minority" means persons designated in census data as Black (African-American); American Indian, Eskimo, or Aleut (Native American); Asian or Pacific Islander; Other; or of Hispanic origin (AFCEE, 1997). According to the USBC, the Hispanic origin designation is separate from the ethnic (racial) designation, as Hispanic persons can be of any race (USBC, 1990; 2000). Within this document, to avoid confusion and eliminate double-counting, the Hispanic population is differentiated from ethnic (racial) minority populations. The ROI definition for Environmental Justice is the same as the one used in Section 3.5, Socioeconomics.

3.6.1. Ethnic Characteristics

This section describes the ethnic characteristics of the nine municipalities surrounding Luke AFB, along with the comparison areas of the City of Phoenix, Maricopa County, the State of Arizona, and the United States. Ethnic data are from the 2000 Census of Population and Housing.

Persons of Hispanic origin constitute the predominant minority in Maricopa County, representing approximately one-quarter of the population; the state has a similar proportion. By comparison, the U.S. is less than 13 percent Hispanic. The Hispanic proportion varies widely within the nine communities surrounding Luke AFB, from a high of 67 percent in El Mirage to a low of 5 percent in Litchfield Park. El Mirage is the only community of the nine in which the Hispanic population actually represents a majority of the population, although Avondale, with 46 percent, is close.

Ethnically, whites are the majority in all nine communities, ranging from 63 percent in Avondale to 92 percent in Litchfield Park. Whites account for about three-fourths of the population in Maricopa County, Arizona, and the U.S. "Some other race" is the most common non-white group in all nine communities, Maricopa County, and Arizona, with relatively small percentages of African-American, American Indian, or Asian populations. Persons identifying themselves as belonging to two or more races (a new category in the 2000 Census) constitute between 1 and 4 percent of the population of the nine

communities, 2.9 percent of Maricopa County and Arizona, and 2.4 percent of the U.S. Table 3.6-1 summarizes the proportions of ethnic and Hispanic populations for the areas.

Table 3.6 1
Ethnic Population of Affected and Comparison Areas, U.S. Census 2000

Place	*Total Population*	*One race*[1]					*Two or more races*[1]	*Hispanic (any race)*[4]
		White	*Black or African American*	*Amer. Indian*[2]	*Asian*[3]	*Some other race*		
United States	281,421,906	211,460,626	34,658,190	2,475,956	10,641,833	15,259,073	6,826,228	35,305,818
% of Total	*100.0%*	*75.1%*	*12.3%*	*0.9%*	*3.8%*	*5.4%*	*2.4%*	*12.5%*
Arizona	5,130,632	3,873,611	158,873	255,879	98,969	596,774	146,526	1,295,617
% of Total	*100.0%*	*75.5%*	*3.1%*	*5.0%*	*1.9%*	*11.6%*	*2.9%*	*25.3%*
Maricopa Co.	3,072,149	2,376,359	114,551	56,706	70,851	364,213	89,469	763,341
% of Total	*100.0%*	*77.4%*	*3.7%*	*1.8%*	*2.3%*	*11.9%*	*2.9%*	*24.8%*
% Of State	*59.9%*	*61.3%*	*72.1%*	*22.2%*	*71.6%*	*61.0%*	*61.1%*	*58.9%*
Towns								
Glendale	218,812	165,293	10,270	3,181	6,296	26,188	7,584	54,343
% of Total	*100.0%*	*75.5%*	*4.7%*	*1.5%*	*2.9%*	*12.0%*	*3.5%*	*24.8%*
Peoria	108,364	92,050	3,012	734	2,197	7,686	2,685	16,699
% of Total	*100.0%*	*84.9%*	*2.8%*	*0.7%*	*2.0%*	*7.1%*	*2.5%*	*15.4%*
Surprise	30,848	26,521	806	134	345	2,427	615	7,184
% of Total	*100.0%*	*86.0%*	*2.6%*	*0.4%*	*1.1%*	*7.9%*	*2.0%*	*23.3%*
El Mirage	7,609	5,042	250	65	33	1,992	227	5,084
% of Total	*100.0%*	*66.3%*	*3.3%*	*0.9%*	*0.4%*	*26.2%*	*3.0%*	*66.8%*
Youngtown	3,010	2,676	41	15	26	218	34	383
% of Total	*100.0%*	*88.9%*	*1.4%*	*0.5%*	*0.9%*	*7.2%*	*1.1%*	*12.7%*
Litchfield Park	3,810	3,508	53	15	118	57	59	209
% of Total	*100.0%*	*92.1%*	*1.4%*	*0.4%*	*3.1%*	*1.5%*	*1.5%*	*5.5%*
Goodyear	18,911	14,775	983	200	339	2,056	558	3,933
% of Total	*100.0%*	*78.1%*	*5.2%*	*1.1%*	*1.8%*	*10.9%*	*3.0%*	*20.8%*
Avondale	35,883	22,704	1,866	459	730	8,727	1,397	16,589
% of Total	*100.0%*	*63.3%*	*5.2%*	*1.3%*	*2.0%*	*24.3%*	*3.9%*	*46.2%*
Buckeye	6,537	4,742	220	112	34	1,264	165	2,396
% of Total	*100.0%*	*72.5%*	*3.4%*	*1.7%*	*0.5%*	*19.3%*	*2.5%*	*36.7%*
Phoenix (city)	1,321,045	938,853	67,416	26,696	28,215	216,589	43,276	449,972
% of Total	*100.0%*	*71.1%*	*5.1%*	*2.0%*	*2.1%*	*16.4%*	*3.3%*	*34.1%*

[1]The 2000 Census was the first census to allow respondents to identify themselves as members of "two or more races."
[2]Includes Alaska Native category.
[3]Includes Native Hawaiian/ Other Pacific Islanders .category.
[4]For this analysis, the category Hispanic was not differentiated by race or national origin.

Source: USBC, 2000 (Census 2000 Redistricting Data (Public Law 94-171) Summary File, Matrices PL1 and PL2)

3.6.2. Income

As noted in Section 3.5.3, Census 2000 income and poverty data at the sub-county level have not yet been released by the USBC, so 1990 Census data are used. As is the case with income measures, it is possible that the relative poverty positions of the communities

have shifted during the 1990s, and that the proportions of low-income populations for each area have changed.

As of 1990, less than 12 percent of Maricopa County's population was below the poverty level, while nearly 16 percent of the state's population and about 13 percent of the U.S. population was in this category (USBC, 1990)[1]. Among the towns, the percent of the population below poverty ranged from a low of 3.7 percent to a high of 32.8 percent. Litchfield Park had the lowest poverty rate, while El Mirage had the highest, with nearly one-third of its residents falling under the poverty threshold in 1990.

Poverty rates within affected census tracts were also examined. As discussed in Section 3.4 (Noise and Land Use), census tracts that lie under the noise contours were identified in order to assess more precisely the impacts of the alternatives. Census tracts boundaries are determined by the USBC based on population, and may not be contiguous with political jurisdictional boundaries. Not all of the communities included in the assessment have affected census tracts; these communities are near Luke AFB but are generally not directly affected by noise levels above 65 L_{dn} .

Among the affected tracts, the lowest 1990 poverty rates (10.4 percent) were found in Census Tract 611 (Luke AFB) and Census Tract 717 (a portion of Youngtown and unincorporated Maricopa County). The highest rates were in Census Tracts 608 and 609, where about one-third of the population fell below the poverty level; both tracts are within El Mirage. Poverty status is determined by income and family size, so areas exhibiting low income characteristics may not reflect high poverty levels if there are many small households (e.g. elderly one- or two-person households) that do not fall under the poverty threshold.

Among the affected census tracts, the only substantial concentration of low-income persons in 1990 was in the El Mirage area. Table 3.6-2 shows the poverty rates for the affected communities and census tracts and comparison areas.

As noted, data are not yet available to accurately assess the location of low-income populations at the present time. (Census 2000 income and poverty data are scheduled for release by the USBC in Summer, 2002.) Although the 1990s were generally an expansive period economically, not all segments of society benefitted from the economic expansion, and not all economic sectors prospered equally. Consequently, a shift in poverty trends and in the location of low-income populations in the West Valley could have occurred over the decade.

[1] As of May 2002, the USBC has not yet released poverty data from the 2000 Census, but has recently included within its 2000 county-level statistics 1997 model-based estimates of persons below poverty. According to these estimates, based on 1997 data, 12.7 percent of Maricopa County residents and 15.5 percent of Arizona residents fall below poverty. The Maricopa County estimate reflects an increase in poverty over the 1990 rate (11.8 percent), while the State experienced a slight decline in poverty from the 1990 rate of 15.7 percent. The U.S. poverty rate has remained at about 13 percent. Sub-county data (for units such as census tracts and blocks) are not yet available.

Table 3.6-2
Poverty in Affected and Comparison Areas, U.S. Census 1990

Place	*Persons in Poverty*	*Percent Below Poverty*
U.S.	31,742,864	*13.1%*
Arizona	564,362	*15.7%*
Maricopa County	247,359	*11.8%*
Towns		
Glendale	16,756	*11.5%*
Peoria	3,914	*7.9%*
Surprise	1,953	*28.0%*
El Mirage	1,625	*32.8%*
Youngtown	340	*14.7%*
Litchfield Park	121	*3.7%*
Goodyear	584	*13.8%*
Avondale	4,493	*28.2%*
Buckeye	1,238	*24.6%*
Phoenix (city)	137,406	*14.2%*
Census Tracts		
506[1](Buckeye)	1,584	*20.4%*
608 (El Mirage)	1,651	*33.5%*
609 (El Mirage)	1,603	*34.0%*
610.05 (Goodyear)	336	*27.9%*
610.06 (El Mirage / Unincorporated County)	692	*14.1%*
610.07 (Surprise)	142	*20.4%*
611 (Luke AFB)	353	*10.4%*
716 (Youngtown / Unincorporated County)	325	*14.3%*
717 (Youngtown / Unincorporated County)	368	*10.4%*
Total for Affected Census Tracts)	7,054	*19.3%*

[1]Census Tract 506 was split into two tracts for the 2000 Census (506.01 and 506.02); both are within the affected area.

Source: USBC, 1990

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

4. ENVIRONMENTAL CONSEQUENCES

This chapter discusses the potential for significant impacts to the human environment as a result of implementing the Proposed Action, an Implementation Alternative, or the No Action Alternative. As defined in 40 CFR Section 1508.14, the human environment is interpreted to include natural and physical resources, and the relationship of people with those resources. Accordingly, this analysis has focused on identifying types of impacts and estimating their potential significance. This chapter discusses the effects that the Proposed Action, the Implementation Alternative, or the No Action Alternative could generate at Luke AFB and the surrounding communities in the environmental resource areas described in Chapter 3.

The concept of "significance" used in this assessment includes consideration of both the context and the intensity or severity of the impact, as defined by 40 CFR 1508.27. Severity of an impact could be based on the magnitude of change, the likelihood of change, the potential for violation of laws or regulations, the context of the impact (both spatial and temporal), degrees of adverse effect to specific concerns such as public health or endangered species, and the resilience of the resource. The criteria used to characterize impacts are introduced at the beginning of each resource section. According to these criteria, adverse impacts of a proposed activity are identified as significant or insignificant. Significant impacts are effects that are most substantial and should receive the greatest attention in decision making. Impacts that are insignificant result in little or no effect to the existing environment and cannot be easily detected. If a resource would not be affected by a proposed activity, a finding of no impact was declared. If a resource would be measurably improved by a proposed activity, a beneficial impact was noted.

Although impacts can be differentiated between short-term and long-term, that differentiation is not relevant in this case. Short-term impacts are generally associated with the construction phase of a project, while long-term impacts are associated with the operations phase. Since there is no construction phase involved in any of the actions under consideration in this document, all impacts would be considered long-term.

Significant adverse impacts can be mitigated through avoidance, minimization, remediation, reduction, or compensation. Certain mitigations are required by law. This analysis did not identify any significant impacts requiring mitigation, as is reflected under the separate resource areas. The document presents best management practices that are necessary or useful to minimize environmental impacts; these discussions are located within each resource area. Best management practices assist the project proponents in maintaining compliance with environmental regulations.

This chapter is organized by resource element in the same order as introduced in Chapter 3. For each resource section, the significance criteria are described. These are followed by a discussion of the analysis methods and the potential impacts of the Proposed Action, the Implementation Alternative, and the No Action Alternative. (The noise and land use section includes a comparison summary of the various alternatives and associated contours.) Lastly, mitigation measures are presented.

The chapter concludes with a discussion of the compatibility of the Proposed Action with objectives of federal, state, and local land use plans, policies, and controls, an evaluation of the relationships between short-term uses of the environment and long-term productivity, cumulative impacts, and irreversible and irretrievable commitments of resources.

As noted in Chapter 3, only relevant resource areas near Luke AFB are described. These include **Aircraft Operations and Safety**; **Air Quality**; **Biological Resources**; **Noise and Land Use**; **Socioeconomics**; and **Environmental Justice**.

4.1. AIRCRAFT OPERATIONS AND SAFETY

Under the Proposed Action, the change in flight operations at Luke AFB would not have a significant impact on aircraft operations, flight safety, or BASH. The Proposed Action would provide a long-term improvement in the viability of the mission at Luke AFB. Impacts from the Implementation Alternative would be similar to those under the Proposed Action. Under the No Action Alternative, impacts to safety would be insignificant, while mission-related impacts to Luke AFB operations would be significant, because the Air Force-required training would not be provided to the full extent.

4.1.1. Significance Criteria

The significance of potential impacts to operations and safety was assessed qualitatively due to the nature of the changes that would occur under the Proposed Action or Implementation Alternative. While a quantitative change in aircraft activity can be determined, it is not possible to assign quantitative significance criteria to such a change. The significance of aircraft operational impacts to flight safety and BASH potential is dependent on the airfield's ability to adapt to such a change through scheduling and amended safety procedures.

A significant impact to aircraft operations would occur if there were a heightened risk of aircraft accidents due to changes in operating procedures or increased BASH potential, and the risk were not mitigated through changes in procedures. A significant impact would also occur if the 56 FW or the 944 FW were unable to meet the mission requirements assigned to them by the Air Force. An insignificant impact would occur if changes in aircraft operations resulted in the need for additional safety measures that required additional personnel, equipment, or BASH control procedures. A beneficial impact would occur if operational changes resulted in a reduced risk of aircraft mishaps and the resulting increase in public safety related to operations at Luke AFB.

4.1.2. Analysis Methods

The impact of the action on Luke AFB operations and safety was assessed by evaluating aircraft operations at Luke AFB, and identifying operations by aircraft based at Luke AFB, deployed aircraft, or transient aircraft. Operational schedules were analyzed to determine routes of arrival and departure, and aircraft operations by time of day. Although the AICUZ program was described in Section 3.1.3, the potential noise impacts related to that program are described in Section 4.4, Noise and Land Use.

4.1.3. Potential Impacts of the Proposed Action

The operational changes that would occur under the Proposed Action include a permanent implementation of the change in direction of arrival and departure, with aircraft arriving and departing to the southwest between 70 and 94 percent of the time. The areas to the southwest of the base are much less densely populated than the areas to the northeast, so the change in direction of takeoff and landing would reduce the risk of an aircraft mishap harming civilians on the ground. (The higher the proportion of operations to the southwest would be, the lower the risk to populated areas.) This would improve safety at Luke AFB. Impacts to operations would be insignificant.

Aircraft carrying live ordnance are currently prohibited from departing Luke AFB to the northeast, due to the greater population density in that direction; this practice would not change. Impacts to Luke AFB operations and safety from the live ordnance flights would be unchanged.

No new flight tracks or airspace would be required, and only existing flight tracks and airspace would be used. There would be no increase in the number of operations. Because departures to the southwest provide a shorter and more direct route to the Barry M. Goldwater Range (BMGR), there would likely be minor reductions in aircraft fuel use and handling, resulting in improved safety conditions and perhaps slightly reduced manpower and equipment requirements for fueling. Impacts to Luke AFB operations and safety would be negligible.

In order to meet the increased need for NVG-trained pilots, some daytime training flights would be shifted to occur during darkness, with a small number of operations (approximately 4 percent) arriving or departing between the hours of 10:00 p.m. and 7:00 a.m. These operations would be similar to those already occurring at Luke AFB and would follow existing procedures, and would have insignificant impacts to operations and safety.

There would be occasional Saturday operations due to adverse weather or other reasons during the normal work week. This would not be an increase in the total number of operations, but would be a shift of operations from a weekday to a Saturday, to enable pilot trainees to meet the syllabus requirements of their training program. The 944 FW currently conducts Saturday operations once per month to meet its AFRC training requirements. When weather or another situation necessitates the occasional Saturday operations by the 56 FW, it would result in Saturday operations twice during that month. On these occasional Saturdays, pilot, maintenance, and airfield personnel would be at work. AGE, refueling equipment, and other maintenance equipment would be used, along with the required aircraft. Normal safety and operational procedures would be in place. Impacts to operations and safety would be insignificant.

The increase in the number of student pilots at Luke AFB would not result in an increase in the number of aircraft operations, nor would it result in changes in established training procedures. Therefore, this component of the Proposed Action would have negligible impacts on operations and safety.

Currently, the frequency of incidents of military bird-aircraft strikes at Luke AFB is not significant, with few strikes per year. The Bird Hazard Working Group records and reports all military bird strikes at the base and initiates actions to reduce hazards if bird problems

do arise. The Proposed Action would not alter any environmental conditions at the base or airport, and the slight change in the number of night flights at the base is not expected to result in an increase in bird-aircraft strikes. Impacts to operations and safety would be insignificant.

4.1.4. Potential Impacts of the Implementation Alternative

Impacts from the Implementation Alternative would be essentially the same as those under the Proposed Action, since the only difference between this alternative and the Proposed Action is the proportion of departures to the southwest (between 50 and 70 percent). Impacts to Luke AFB operations and safety would be insignificant. As noted previously, risk associated with overflights of populated areas would be reduced by a higher proportion of operations to the southwest.

4.1.5. Potential Impacts of the No Action Alternative

Under the No Action Alternative, the 56 FW would resume takeoffs and landings to and from the more heavily populated northeast, with a greater potential for mishaps harming civilians than would be the case in the less-populated areas southwest of the base. This increased risk could lead to a potentially significant impact to safety at Luke AFB; however, the use of long-established best management safety practices reduces this to an insignificant impact.

Without the shift of some operations to nighttime, the 56 FW would not be able to meet the pilot-training requirements assigned to it by the Air Force for NVG-trained pilots. Failing to conduct Saturday operations to replace weekday adverse weather cancellations would prevent student pilots from completing their training requirements within the allotted time. Not increasing the number of pilots in training operations at Luke AFB would prevent the Air Force from meeting its need for trained fighter pilots as part of the defense of the United States. These mission-impairing impacts of the No Action Alternative would be significant.

4.1.6. Mitigation Measures

No significant impacts have been identified as a result of the Proposed Action or Implementation Alternative, and no mitigation measures are required for either of these alternatives. No mitigations are available for the significant mission-related impacts identified under the No Action Alternative.

4.2. AIR QUALITY

The Proposed Action could result in a slight reduction in air quality impacts, compared to the No Action Alternative. There would be the same number of aircraft operations under the Proposed Action as under the No Action Alternative (i.e., prior to the temporary changes in flight direction). A greater proportion of these operations would depart directly toward the BMGR, thus reducing the length of flights and overall air emissions. The Proposed Action does not include any addition or modification of a stationary source or construction, or increased use of aerospace ground equipment or fueling operations. The

Proposed Action conforms to the SIP and is exempt from further conformity review. Impacts to air quality under the Proposed Action would be insignificant.

The flight lengths for the Implementation Alternative would be more than under the Proposed Action, but less than under the No Action Alternative; consequently emissions would be slightly reduced, but less than under the Proposed Action. The Implementation Alternative also conforms to the SIP and is exempt from further conformity review. Under the No Action Alternative, emission levels that existed prior to the temporary changes in flight operations would resume. Impacts to air quality under the Implementation or No Action Alternatives would be insignificant.

4.2.1. Significance Criteria

The significance of impacts to air quality is based on federal, state, or local pollution regulations or standards. Because Luke AFB is located within a nonattainment area for CO, O_3, and PM_{10}, potential significance is defined within the context of regional significance and conformity with the SIP for each specific criteria pollutant. Regional significance thresholds and conformity thresholds are defined in 40 CFR 51 Subpart W.

A significant impact would be non-conformance with the SIP, or an exposure of sensitive receptors to excessive quantities of fugitive dust or other pollutants. A beneficial impact to air quality would be a measurable reduction in baseline emissions.

4.2.2. Analysis Methods

The analysis was based on a review of existing air quality in the region, information on Luke AFB air emission sources, past and proposed future aircraft operations, projections of emissions from the proposed activities, a review of the SIP, and the use of air emission factors from the USEPA or similar sources. The emissions predicted for the Proposed Action and Implementation Alternative were compared to the No Action Alternative (emission levels prior to the temporary changes in flight operations implemented several months ago). The total number of aircraft operations would not change under the Proposed Action or Implementation Alternative, and overall air emissions are expected to decline slightly due to the use of more direct routes from Luke AFB to the training areas. Consequently, detailed calculations of emission levels were not necessary for this EA.

4.2.3. Potential Impacts of the Proposed Action

Under the Proposed Action, there would be a smaller proportion of departures to the northeast, as compared to No Action Alternative. Aircraft departing Luke AFB for the BMGR would have a shorter flight distance, and consequently, overall aircraft emissions would likely be slightly reduced. Aircraft operations produce mobile emissions that are exempt from air pollution permitting requirements but must still be in conformity with the SIP. Emissions from AGE are also exempt from Luke AFB permitting requirements, as are emissions generated from personal vehicles.

The stationary emissions estimated for the Luke AFB Emissions Inventory would be essentially unchanged as a result of the Proposed Action, because the number and type of operations are not projected to change. No new permanent personnel authorizations are planned as a result of the Proposed Action, nor is there any new construction or

modification of a stationary source needed to support any component of the Proposed Action; PSD requirements would not apply. If most aircraft depart to the southwest, slightly less fuel may be needed because of the shorter distance to the BMGR. Consequently, stationary emissions from fuel tanks could be less based on the throughput of fuel. The annual emission fee for stationary emissions in 2000 could be slightly less in the future if the Proposed Action were implemented, assuming no change in the dollar/ton rate charged by Maricopa County.

Because the significance criteria are tied to compliance with the SIP for the Maricopa Intrastate AQCR, the analysis focuses on conformity for CO, O_3 (NO_x and VOC are precursors to O_3 generation), and PM_{10}. As noted in Section 3.2, the mixing zone for this AQCR averages 2,100 ft. Flight profiles departing Luke AFB to the northeast and southwest were compared; the emissions within the mixing zone for determining conformity of criteria air pollutants would be the same because the engine settings at various altitudes would not change based on direction of departure. Because no increases or new emissions are projected to occur as the result of permanently implementing the temporary changes in flight direction, the amounts of CO, NO_x, VOC, and PM_{10} would be below *de minimus* levels. The SIP for the Maricopa Intrastate AQCR provides projected budgets of pollutants for particular locations and activities within Maricopa County. These are not analyzed here because no increase in emissions is projected. The emissions would conform to the SIP and no significant air quality impacts would occur. Because no increase in emissions is projected under the Proposed Action, the action is exempt from further conformity analysis pursuant to 40 CFR 93.153. The emissions occurring under the temporary change in flight directions would continue at current levels. Impacts to air quality under the Proposed Action would be insignificant.

4.2.4. Potential Impacts of the Implementation Alternative

The Implementation Alternative would result in slightly more emissions than the Proposed Action but less than the No Action Alternative; compared to the Proposed Action, there would be more flights departing to the northeast. The flight paths and times would be slightly longer, with the aircraft burning more fuel and creating more emissions, than under the Proposed Action. Compared to the No Action Alternative, the number of departures to the northeast would be fewer and would result in a slight decrease in emissions. Emissions within the mixing zone would be the same as for the No Action Alternative. Consequently, the Implementation Alternative would conform to the SIP, and this alternative is exempt from further conformity analysis pursuant to 40 CFR 93.153. Requirements under PSD would not apply under this Alternative. Assuming the current rate structure continues, the annual emission fee for stationary sources would be negligibly more than under the Proposed Action, but less than under No Action Alternative. Impacts to air quality under this alternative would be insignificant.

4.2.5. Potential Impacts of the No Action Alternative

The No Action Alternative would result in the same level of emissions that occurred before the temporary changes in the proportion of departures and landings by flight direction. Because there would be no change in emissions, conformity analysis is not applicable. No significant air quality impacts would occur.

4.2.6. Mitigation Measures

No mitigations are necessary, since there are no significant impacts to air quality.

4.3. BIOLOGICAL RESOURCES

As discussed in Section 3.3, the evaluation of biological resources is limited to threatened, endangered, or candidate species. Impacts to protected species would not be significant as a result of the changes associated with the Proposed Action. No construction or demolition would occur and no critical habitat would be disturbed. Impacts from the Implementation Alternative would be the same as those under the Proposed Action. Under the No Action Alternative, flight operations ongoing prior to the temporary change would resume and there would be no significant impacts to threatened or endangered species.

4.3.1. Significance Criteria

Impacts to biological resources would be significant if the viability of any threatened or endangered species were jeopardized, with little likelihood of re-establishment after completion of the action. An adverse but insignificant impact would result if the disturbed population could be re-established to its original state and condition, or the population is sufficiently large or resilient to respond to the action without measurable change. The significance of an impact is also dependent upon the importance of the resource, and the proportion of the resource that could be affected relative to its occurrence in the vicinity. An increase in the population of a protected species in response to an enhanced habitat, or the increased viability of a species, could be considered a beneficial impact.

4.3.2. Analysis Methods

The assessment of potential impacts to threatened or endangered species focused on the existing and proposed flight paths relative to the known species on or around Luke AFB. The Luke AFB *Integrated Natural Resource Management Plan* (USAF, 1997b), the *Biological Assessment for Lesser Long-Nosed Bat and Cactus Ferruginous Pygmy Owl* (USFWS, 1997), a letter from the Arizona Game and Fish Department (AG&FD) (dated August 29, 2001; see Appendix A), and prior environmental assessments were reviewed to provide data on threatened or endangered species on and near the base. The predicted impacts were then compared to the significance criteria.

4.3.3. Potential Impacts of the Proposed Action

There would be no construction, demolition, or ground-disturbing activities associated with the Proposed Action; therefore, no critical habitat for federal or state threatened or endangered species would be disturbed. Consequently, the potential for any direct impact from the Proposed Action to the endangered Yuma clapper rail, American peregrine falcon, or southwestern willow flycatcher is not likely to occur. Since no habitat would be disturbed, impacts to the ferruginous hawk and Yavapai Arizona pocket mouse would not be considered significant. The burrowing owl, which inhabits rodent burrows near the main runway, should sustain a decrease in aircraft strike potential as a result of the Proposed Action. Because this owl forages primarily during dawn and dusk, the shifting of a small number of aircraft operations from daytime to after dark could slightly decrease

the number of owl fatalities associated with aircraft strikes (also see Section 4.1.3). Management recommendations in the Integrated Natural Resources Management Plan are for continued research on the burrowing owl populations on base to determine the potential aircraft bird strike hazard. The Environmental Programs Flight could relocate the birds off base if they are determined to be a hazard to aircraft (USAF, 1997b). Impacts from the Proposed Action would not be significant to the burrowing owls. The possibility for the spotted, California leaf-nosed, or lesser long-nosed bats to occur on Luke AFB is extremely remote and no ground-disturbing activities would occur that could disturb the bat habitats. Impacts to bat species from permanently implementing the proposed flight changes are not considered to be significant.

Since the number of flight operations would not increase, noise levels would remain consistent with current levels, but would shift more to the southwest. Past data on the likely effects of low-level jets on nesting peregrine falcons and other raptors were gathered at areas in Arizona. Responses to extremely frequent and nearby jet aircraft were often minimal and never associated with reproductive failure. Nesting success and site re-occupancy rates were high for all areas. The birds observed were noticeably alarmed by the noise stimuli (82 to 114 dBA), but the negative responses were brief and apparently not productivity limiting (USFWS, 1988). The effects of noise levels on bats is not known.

The Air Force requested information on the Proposed Action and Alternatives from the USFWS, Ecological Services Office, and the AG&FD. The AG&FD responded that the Department's Heritage Data Management System had been accessed and current records did not indicate the presence of any special status species as occurring in the project vicinity. They also noted that the project did not occur in the vicinity of any proposed or designated critical habitats (see AG&FD letter, Appendix A).

While there would be a change in the direction of aircraft departures and a shift to more nighttime flights from the Proposed Action, the aircraft would use existing flight profiles and patterns. No significant impacts to threatened or endangered species are projected to occur from these flight changes.

4.3.4. Potential Impacts of the Implementation Alternative

Impacts under this Implementation Alternative would be the same as those under the Proposed Action. The difference in direction of takeoff would not cause any significant impacts to threatened, endangered, or candidate species.

4.3.5. Potential Impacts of the No Action Alternative

The current impacts to threatened, endangered, or candidate species from flight operations around Luke AFB are not significant. No significant impacts occurred prior to implementation of the temporary changes in flight operations. If no action is taken to implement the temporary changes, impacts would remain insignificant to threatened or endangered species.

4.3.6. Mitigation Measures

No significant impacts to threatened or endangered species were identified, so no mitigation measures are required.

4.4. NOISE AND LAND USE

Impacts on the noise environment are related to the magnitude of the noise levels, and the proximity of noise-sensitive receptors to the noise source. As noted in Section 3.4, noise and land use are discussed together because changes in aircraft operations can result in changes in noise levels that affect land use. There would be varying levels of insignificant impacts to the noise environment in the communities surrounding Luke AFB from the Proposed Action, Implementation Alternative, or No Action Alternative.

Under the Proposed Action, in which 70 to 94 percent of arrivals and departures would be to the southwest, there would be fewer noise impacts affecting populations and land use to the northeast, especially in El Mirage and nearby areas. With 94 percent of arrivals and departures to the southwest, the least number of people and the least amount of residential land would be affected. The 65 L_{dn} contours for the Proposed Action (both 94 and 70 percent to the southwest) extend outside of the JLUS contour in small areas to the southwest of Luke AFB; the 94 percent contour (i.e., representing 94 percent of operations to the southwest) exceeds the JLUS contour by 268 acres, and the 70 percent contour, by 83 acres. These exceedances of the JLUS contour would occur within the context of the legally-designated territory within a military airport, where noise is required to be attenuated to 65 L_{dn} or less, and would thus have only insignificant impacts on land use. Under the Proposed Action, the 65 L_{dn} contour would not exceed the JLUS contour in residential areas in El Mirage, as it does under baseline conditions; this would be an improvement over baseline conditions. Impacts to the less-populated and largely agricultural or open lands to the southwest would be insignificant.

Under the Implementation Alternative, 50 to 70 percent of operations would be to the southwest. Noise impacts northeast of the base would also be reduced (compared to the No Action Alternative), but to a lesser extent than under the Proposed Action. The Implementation Alternative affects more land and people than the Proposed Action, but less than the No Action Alternative. The Implementation Alternative affects the least amount of land outside the JLUS contour. The 83 acres of exceedance under the 70 percent contour is almost all agricultural, while the 55 acres under the 50 percent contour is predominantly residential (in and around El Mirage). Impacts would be insignificant both to the urbanized areas to the northeast and to the less-populated lands to the southwest.

Under the No Action Alternative, the temporary directional changes would cease, and flight operations would be to the northeast 70 percent of the time. Insignificant adverse noise impacts to the heavily populated area northeast of Luke AFB would resume, with possible insignificant adverse impacts to economic growth throughout the areas involved. The amount of affected land outside the JLUS contour is 448 acres (substantially more than under the Proposed Action or Implementation Alternative), and primarily impacts agricultural land to the west of the base, and residential areas, industrial land, and open space in El Mirage.

4.4.1. Significance Criteria

The significance of noise impacts is measured by levels of human exposure to noise and the subsequent impacts on land use. At Luke AFB, significance is determined in

accordance with the standards described in A.R.S. 28-8481 and 28-8482 (see Section 3.4.5.2), and the U.S. Air Force AICUZ program guidance.

Increasing the exposure of sensitive receptors to noise levels greater than 74 L_{dn} would be adverse, and depending on the number of people affected, could be significant. The degree of impact is influenced by the receptors' familiarity with and attitude toward the noise source, and the time of day the noise occurs. Increasing a sensitive receptor's exposure to noise levels between 65-74 L_{dn} could also be adverse, but to a lesser extent than exceeding the 74 L_{dn} threshold. Exposure of noise-sensitive receptors to levels less than 65 L_{dn} could result in an insignificant impact. Reducing noise levels from above 65 L_{dn} to below 65 L_{dn} would be a beneficial impact, especially for residential areas or sensitive receptors.

As noted in Section 3.4.5.2, the A.R.S. 28-8481 sets limits on the construction or expansion of structures in areas according to noise levels, as measured by L_{dn}. The AICUZ program also recommends threshold noise levels for various land uses. Increasing noise levels (as measured by L_{dn}) above the limitations set for existing land uses could be considered significant, depending upon the area involved.

Constraints on the economic use of land could result from limitations set by local governments because of exposure to high noise levels. If a given parcel of land were reclassified into a more restrictive category of land use, this could be a locally adverse impact. However, it would not be significant unless large quantities of land were reclassified, no other land were available for use or development, or the restrictions resulted in reduced economic activity in the area.

4.4.2. Analysis Methods

Current and projected data for aircraft operations, maintenance, and ground run-ups were provided by operations personnel from the 56 FW and 944 FW. These data were entered into NOISEMAP 6.5, a software program that calculates day-night average sound levels (L_{dn}) in the vicinity of an airfield and generates noise contours and other information. The contours provide a graphic representation of the affected area, and the acreage of the area is used as a basis for numerically assessing the impact on land use. The analysis of noise and land addresses impacts to land use and population in the affected areas. The following paragraphs describe the methodology used to assess impacts to these two topics.

Impacts to land use were assessed by mapping the noise contours for the JLUS, the Proposed Action, the Implementation Alternative, and the No Action Alternative, and overlaying the contours onto a map of affected communities. This map was compiled from U.S. Census 2000 Topologically Integrated Geographic Encoding and Referencing system (TIGER) maps showing community boundaries and streets. A generalized land use map for areas within the contours was constructed, using GIS maps and aerial photography from the Maricopa County Assessor's Office. A planimeter was used to measure each parcel of land use under each of the contours. These areas were compiled in a spreadsheet to calculate total areas of each class of affected land use. Land use was classified in accordance with *Air Force Handbook 32-7084, AICUZ Program Manager's Guide*, and with the land classifications used by the Maricopa Association of Governments and communities surrounding Luke AFB. Land use classes are described in Section 3.4.4.

Total land area by census tract was obtained from the 1990 Census of Population and Housing (these data are not available from the 2000 Census and the values are unchanged).

Population data are from the *Census 2000 Summary File 1 (SF-1) 100 percent* data sets. Population impacts were assessed by mapping census blocks (the smallest census unit) in the vicinity of each set of contours. The area of blocks within the contours was estimated and compiled in a spreadsheet to calculate the affected population in each block. Because the block is the smallest unit available, it was assumed for this analysis that population is distributed evenly throughout the block.

There are two concentrated residential areas on base, the family housing area east of Litchfield Road and a dormitory area in the southeastern portion of the main base. However, a few additional dormitories are located in other areas of the base within the 75-79 L_{dn} noise contours. The concentrated residential areas are shown as yellow blocks on the land use maps (Figures 4.4.1, 4.4.2, 4.4.3, and 4.4.4), while the approximate location of the other dormitories is shown with a yellow circle. Because land use was generalized, the additional dormitories are not categorized as residential land use for the base and are not included in the acreage estimates. However, the population within the additional dormitories is included, leading to an apparent discrepancy between affected land use and affected population at noise levels of 75 L_{dn} and above. For this reason, no affected on-base residential land use at noise levels of 75 L_{dn} and above is shown under the 94 percent, 70 percent, or 50 percent contours (see Tables 4.4-4 and 4.4-7), although there are on-base residents at the 75 L_{dn} and above noise level (see Table 4.4-5).

4.4.3. Summary Comparison of Contours

This section provides a comparison summary of the impacts to population and land use of each contour, along with a comparison of exceedance of the JLUS by contour. The No Action Alternative (representing 30 percent of operations to the southwest) impacts the greatest amount of land and the largest number of people within the JLUS contour: 14,500 acres (65 percent of the land), and 8,054 people (nearly 84 percent of the population).

As shown in Table 4.4-1, the Proposed Action's contour representing 94 percent of operations to the southwest impacts the least amount of land, nearly 11,000 acres (49 percent of the JLUS area), and the smallest number of people, only 1,560 (16 percent of the population within the JLUS contour). The 70 percent contour is next, with impacts to nearly 12,000 acres (54 percent of JLUS) and 3,000 people (31 percent of JLUS). The Implementation Alternative's lower bound 50 percent contour impacts 12,240 acres (55 percent of JLUS) and nearly 5,000 people (52 percent of JLUS).

A concern regarding potential impacts is exceedance of the JLUS contour by any contour associated with the Proposed Action or Implementation Alternative. These exceedances are summarized here; detailed descriptions are found in Sections 4.4.4.2.3 (94 percent contour), 4.4.4.3.3 (70 percent contour, and 4.4.5.5.3 (50 percent contour). Figure 4.4-1 presents the 65 L_{dn} contours for the 94 percent, 70 percent, and 50 percent contour sets, along with the No Action Alternative (baseline) and JLUS contour. All 65 L_{dn} contours are overlain on a single land use map to allow a comparison of specific areas of impact. No contours reflecting noise levels above 65 L_{dn} for any alternative exceed the JLUS contour.

Table 4.4-1
Summary Comparison of Acreage and Population Impacts, by Alternative and Noise Level

Alternative	Acreage Affected			Population Affected		
	On-Base	Off-Base	Total[1]	On-Base	Off-Base	Total[1]
Proposed Action: 94 Percent of Operations to the Southwest (Upper Bound) / 70 Percent to Southwest (Lower Bound)[2]						
65-69 L_{dn}	244 –327	4,736 – 5,287	4,980 – 5,615	528 – 537	290 – 1,690	827 – 2,218
70-74 L_{dn}	288 – 289	2,674 – 2,913	2,962 – 3,201	350 – 405	100 – 123	450 – 528
75 L_{dn} and greater	1,355 – 1,530	1,601 – 1,686	3,041 – 3,131	205	55 – 80	260 – 285
Sub-Total[1]	**1,887 – 2,146**	**9,096 – 9,801**	**10,983 – 11,947**	**1,092 – 1,138**	**470 – 1,868**	**1,562 – 3,006**
Implementation Alternative: 70 Percent to Southwest (Upper Bound) / 50 Percent to Southwest (Lower Bound)[2]						
65-69 L_{dn}	311 – 327	5,287 – 5,511	5,615 – 5,822	528 – 787	1,690 – 3,253	2,218 – 4,040
70-74 L_{dn}	284 – 289	2,913 – 2,991	3,201 – 3,275	405 – 459	123 – 262	528 – 721
75 L_{dn} and greater	1,530 – 1,558	1,586 – 1,601	3,131 – 3,144	177 –205	54 – 55	231 – 260
Sub-Total[1]	**2,146 – 2,153**	**9,801 – 10,088**	**11,947 – 12,241**	**1,138 – 1,423**	**1,868 – 3,569**	**3,006 – 4,992**
No Action Alternative: 30 Percent to Southwest[2]						
65-69 L_{dn}	263	6,084	6,348	1,385	4,979	6,364
70-74 L_{dn}	255	3,640	3,894	641	511	1,152
75 L_{dn} and greater	1,933	2,379	4,312	405	133	538
Sub-Total[1]	**2,451**	**12,103**	**14,554**	**2,431**	**5,623**	**8,054**
JLUS Contour						
65 Ldn and greater	2,545	19,773	22,318	3,525	6,092	9,617

[1]Numbers may not add due to rounding.
[2]The first value presented in the range of affected acreage or population is usually the value for the first contour, but not always. Appendix B provides detailed tables.
Sources (Census data): USBC, 1990 (land area); USBC, 2000 (population).

The 94 percent contour, representing the upper bound of the Proposed Action, exceeds the JLUS by 268 acres, with nearly all (95 percent) in agricultural lands. The 70 percent contour is the lower bound of the Proposed Action and the upper bound of the Implementation Alternative, and exceeds the JLUS by 83 acres; again, nearly all (96 percent) of the exceedance area is agricultural. The 50 percent contour, the lower bound of the Implementation Alternative, exceeds the JLUS by only 55 acres, but nearly all (91 percent) affects residential land use (in El Mirage).

The 65 L_{dn} contour for the No Action Alternative (reflecting 30 percent of operations to the southwest and 70 percent to the northeast) exceeds the JLUS substantially more than any other alternative, with nearly 450 acres falling outside the JLUS contour. About 57 percent of the exceedance is agricultural land, and 13 percent is residential.

Detailed illustrations of all contours follow the comparison graphic of the 65 L_{dn} contours. The 94 percent proportion (Figure 4.4-2), the 70 percent proportion (Figure 4.4-3), and the 50 percent proportion (Figure 4.4-4), are each overlain on a land use map of the area. Table 4.4-2 summarizes the JLUS exceedances within each land use category, by alternative.

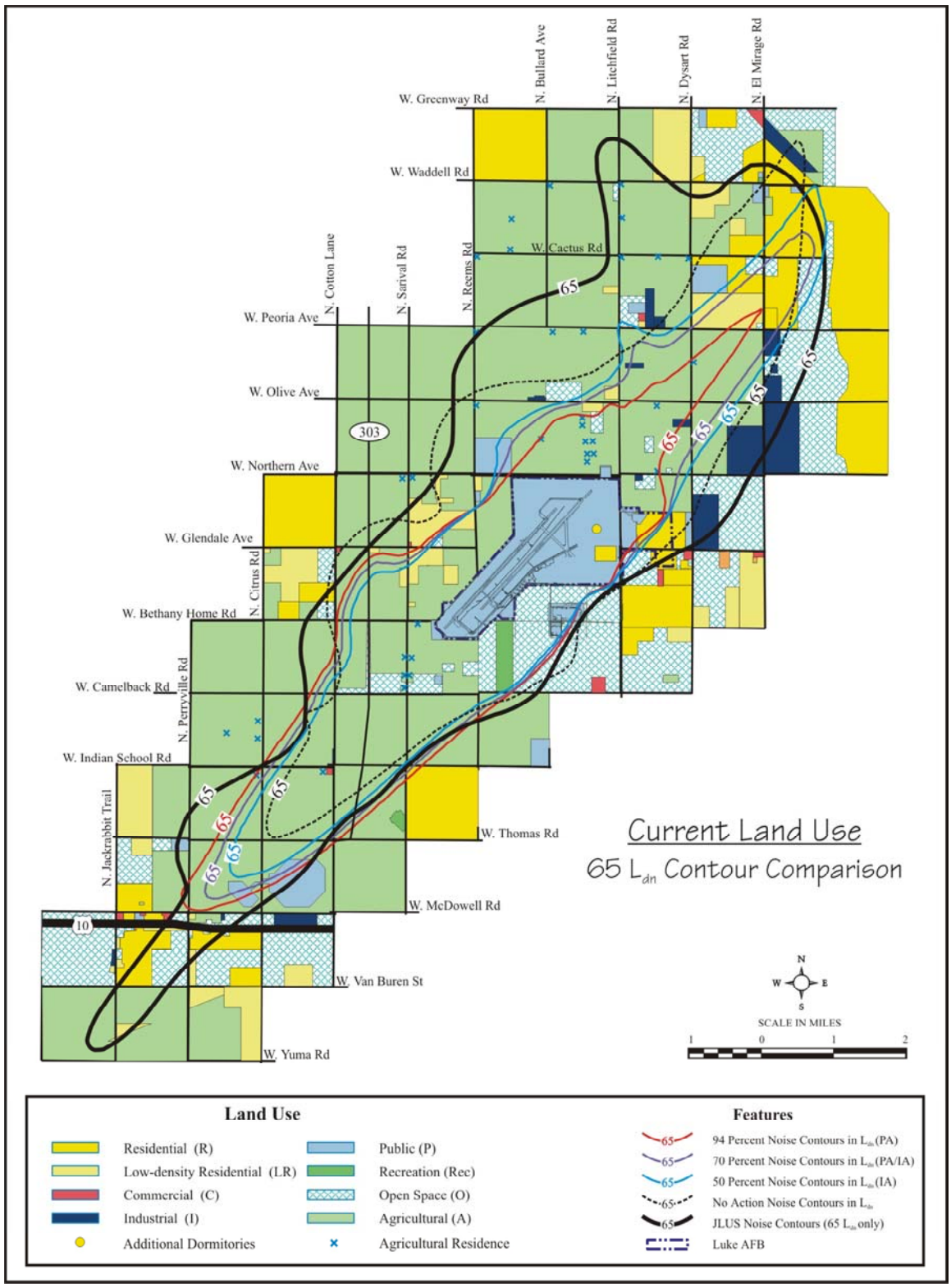

Figure 4.4-1. Land Use Comparison of 65L_{dn} Contours, All Alternatives and JLUS

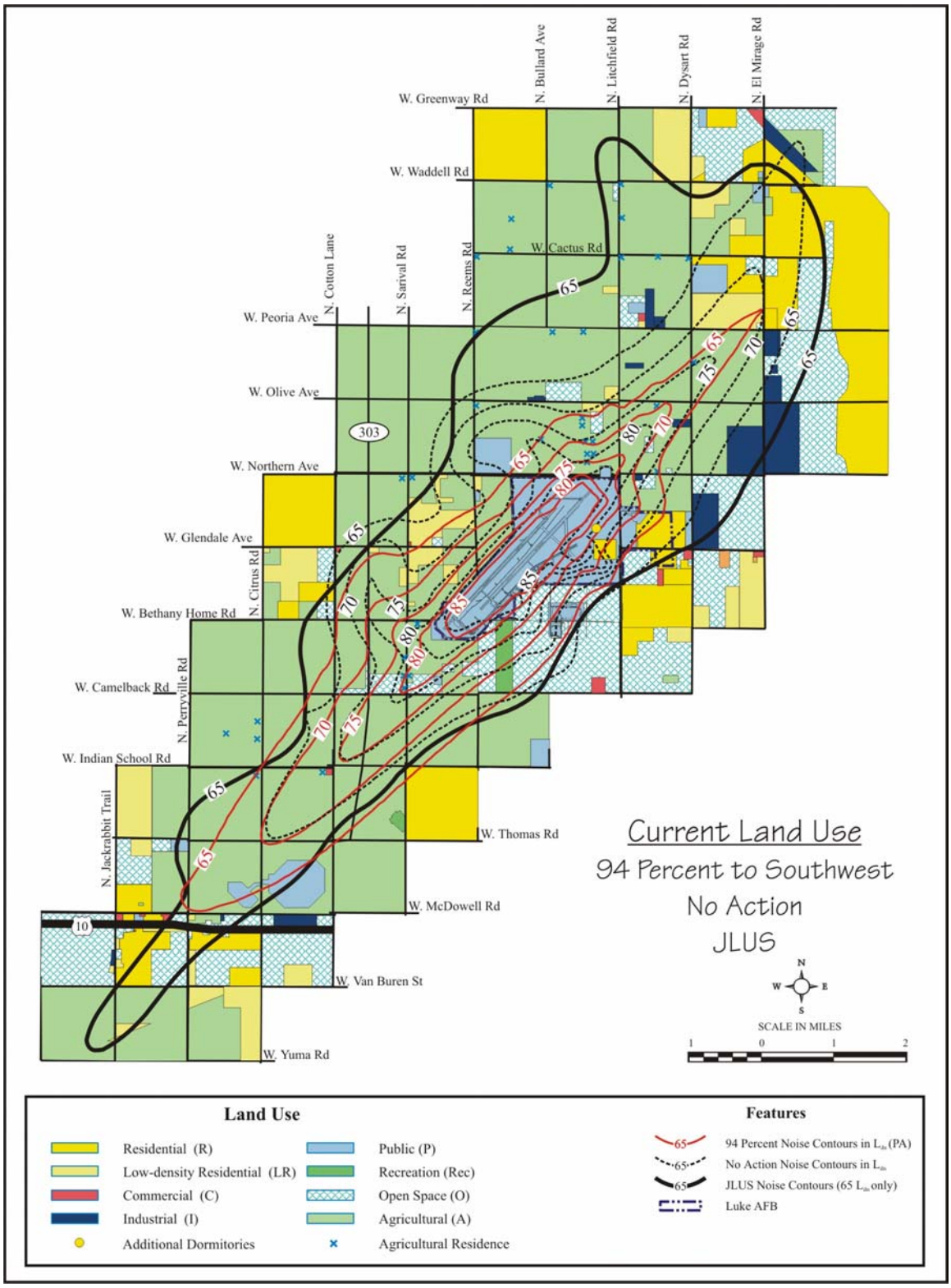

Figure 4.4-2. Land Use Under 94 Percent Contours, Compared to JLUS and No Action

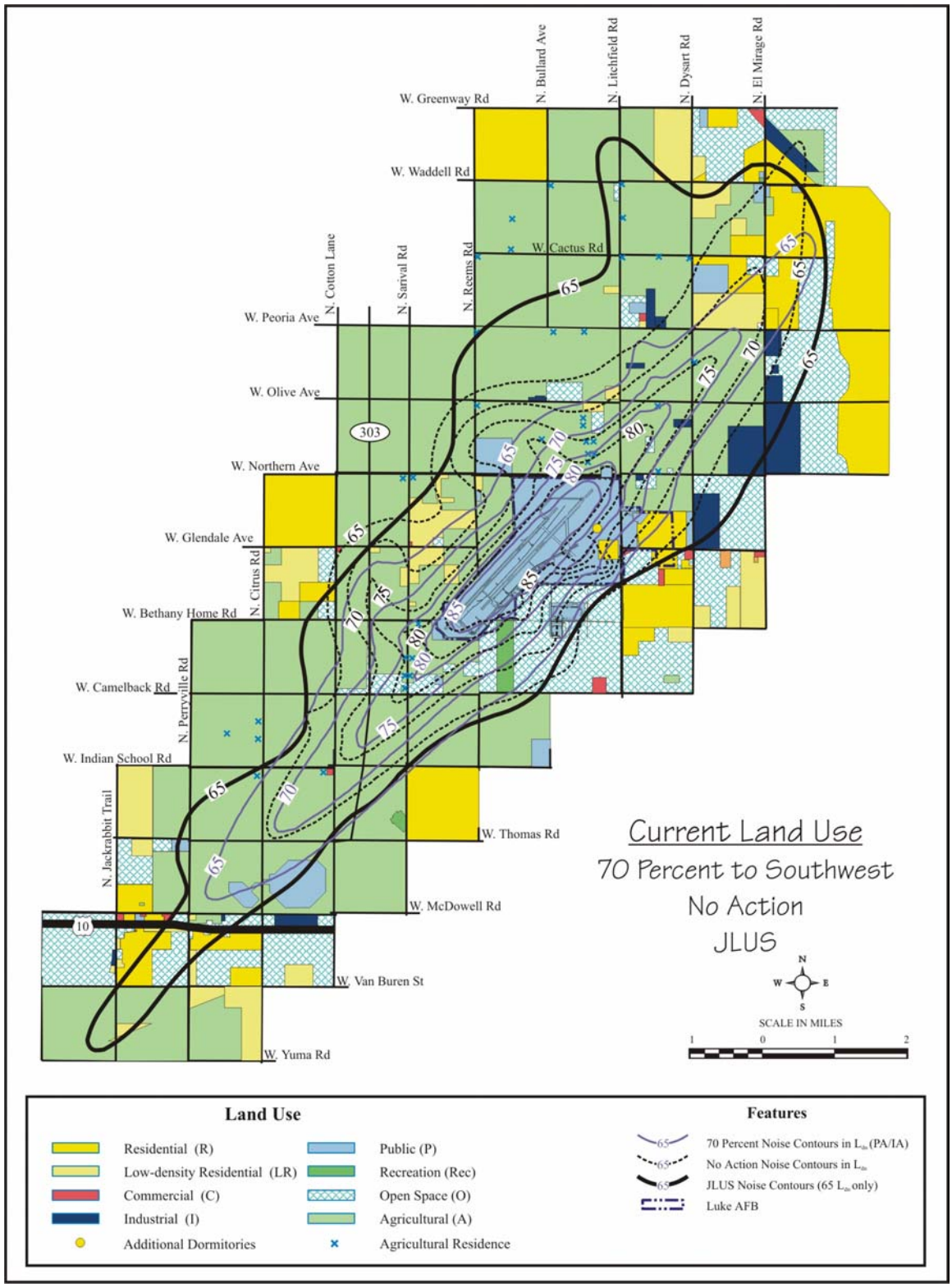

Figure 4.4-3. Land Use Under 70 Percent Contours, Compared to JLUS and No Action

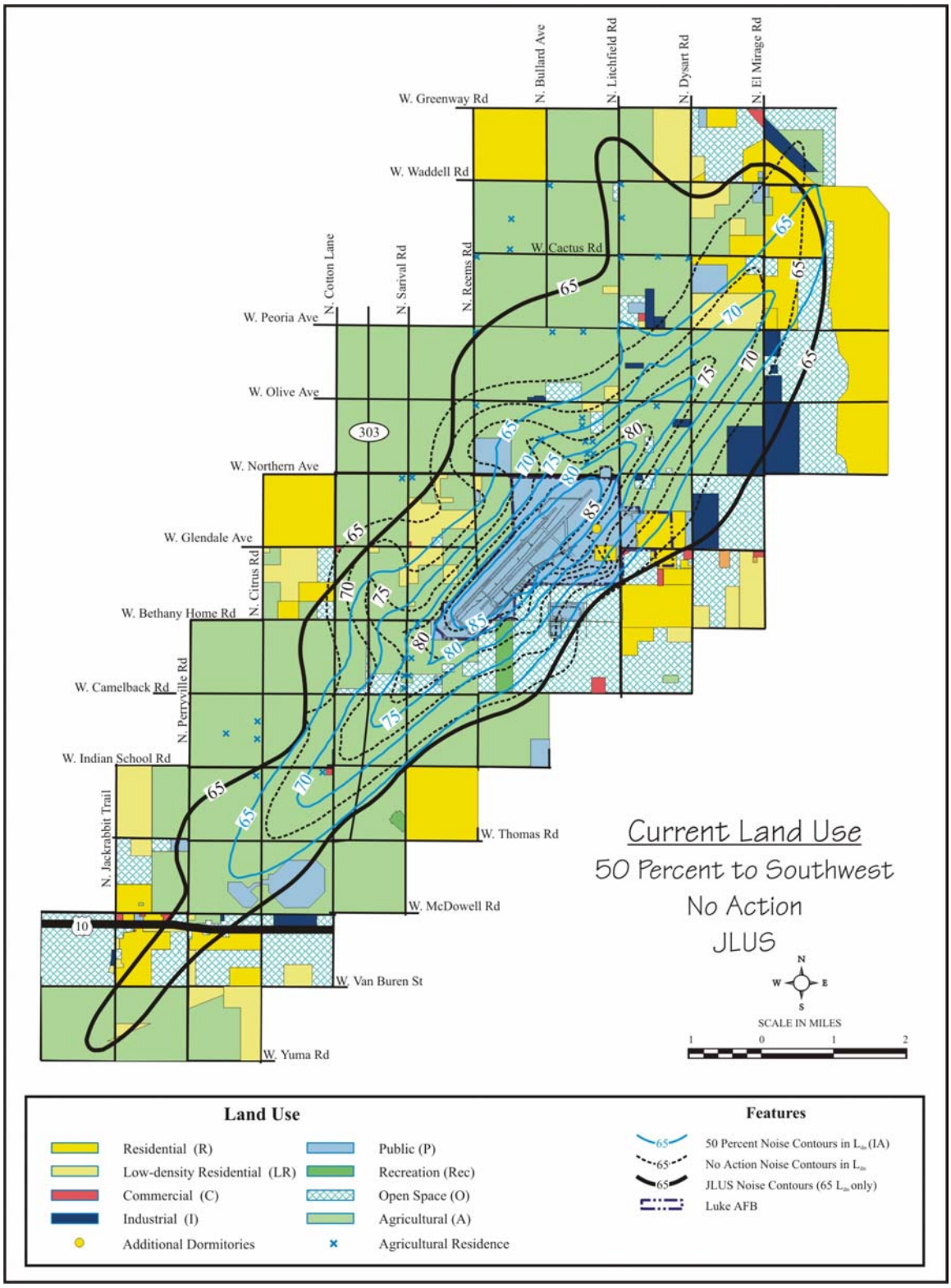

Figure 4.4-4. Land Use Under 50 Percent Contours, Compared to JLUS and No Action

Table 4.4-2 Exceedance of JLUS Contour in Acres, by Land Use Category and Alternative				
Land Use Category	**94 Percent to Southwest (PA Upper Bound)**	**70 Percent to Southwest (PA Lower Bound; IA Upper Bound)**	**50 Percent to Southwest (IA Lower Bound)**	**30 Percent to Southwest (No Action Alternative)**
Low-density Residential	-	-	-	1.3
Residential	14.0	3.2	49.5	56.5
Commercial	-	-	-	0.7
Industrial	-	-	-	34.9
Agricultural	254.2	80.0	-	255.8
Recreational	-	-	-	-
Open Space	-	-	5.1	93.3
Public	-	-	-	5.8
Total	**268.2**	**83.2**	**54.6**	**448.3**
PA = Proposed Action; IA = Implementation Alternative				

4.4.4. Potential Impacts of the Proposed Action

Under the Proposed Action, between 70 and 94 percent of operations would occur to the less-populated southwest. There would be a slight increase in the number of nighttime flights (between 10 p.m. and 7 a.m.), but the total number of operations would not change. The proportion of flights taking off to the southwest would be greater than under the Implementation Alternative and even greater compared to the No Action Alternative. Noise-related impacts to land use and population would be less than under the Implementation Alternative or the No Action Alternative.

The assessment begins with a discussion of general noise impacts to sensitive receptor and other locations in the vicinity of Luke AFB and the impacts of nighttime operations. This is followed by a discussion of the impacts of the upper bound of Proposed Action (94 percent of operations to the southwest) and the lower bound (70 percent of operations to the southwest).

4.4.4.1. Impacts to the Noise Environment

Table 4.4-3 provides estimates of sound levels at 15 sensitive receptor locations, as measured by the L_{dn}, which captures the effect of noise over an average 24-hour period.

Noise levels (in L_{dn} units) would decrease at 10 of the 15 locations, compared to baseline conditions (see Table 3.4-2). The five locations where noise levels would increase are Perryville Women's Center, Scott Libby Elementary School, and three neighborhood intersections locations (the intersections of N. 181st Avenue and W. Lynwood Street, and of N. Sarival Road and W. Indian School Road, both in Goodyear, and the intersection of N. 191st Avenue and W. McDowell Road in Buckeye).

Table 4.4-3
Noise Levels at Sensitive Receptor and Other Locations, Proposed Action

Name	*Location with Latitude and Longitude*	*Noise Level in Decibels (L_{dn}[1])*	
		94 Percent to Southwest	**70 Percent to Southwest**
Dysart High School	N. Dysart Road and Varney Road, El Mirage Lat 33°35.286'N., Long 112°20.433'W.	54.50	60.04
Dysart Junior High School	11405 N. Dysart Road, El Mirage Lat 33°35.603'N., Long 112°20.500'W.	51.44	56.57
El Mirage Baseball Park	W. Waddell Road and N. El Mirage Road, El Mirage Lat 33°36.552'N., Long 112°19.493'W.	53.16	57.53
El Mirage Elem. School	12308 W. Waddell Road, El Mirage Lat 33°36.546'N., Long 112°19.500'W.	53.17	57.51
El Mirage Library	N. El Mirage Road and W. Ventura Street, El Mirage Lat 33°36.649'N., Long 112°19.496'W.	52.81	57.10
Fowler Park	Northeast of N. Litchfield Road and W. Glendale Avenue, Glendale Lat 33°32.478'N., Long 112°20.174'W.	56.81	57.01
Ludden Park	N. Capistrano Drive and W. Waddell Road, El Mirage Lat 33°36.519'N., Long 112°19.496'W.	53.26	57.65
Luke Elem. School	W. Thunderbird Street and Navajo Circle, Glendale Lat 33°32.413'N., Long 112°20.525'W.	59.16	59.41
Perryville Women's Center	Northwest of N. Citrus Road and W. McDowell Road, Goodyear Lat 33°28.176'N., Long 112°26.824'W.	66.11	64.86
Scott Libby Elem. School	18706 W. Thomas Road, Maricopa County Lat 33°28.718'N., Long 112°27.728'W.	61.32	60.04
Western Sky Middle School	4095 N. 144th Avenue, Litchfield Park Lat 33°29.589'N., Long 112°22.108'W.	49.96	49.18
Neighborhood / Intersection 1	Intersection of N. 181st Avenue and W. Lynwood Street, Goodyear Lat 33°27.854'N., Long 112°26.913'W.	63.33	62.05
Neighborhood / Intersection 2	Immediately W. of Intersection of W. Rose Lane/ Claremont and N. Cotton Lane, Maricopa County Lat 33°31.587'N., Long 112°25.692'W.	63.25	62.14
Neighborhood / Intersection 3	Intersection of N. 191st Ave and W. McDowell Road, unincorp. Maricopa County / Buckeye Lat 33°27.882'N., Long 112°28.215'W.	63.57	62.29
Neighborhood / Intersection 4	Intersection of N. Sarival Road and W. Indian School Road, Goodyear Lat 33°29.620'N., Long 112°24.570'W.	66.82	65.54

[1] L_{dn}: Day-Night Average Sound Level (an averaged measure that describes the 24-hour or daily noise environment).
Source: Maricopa County Assessors Office GIS Map, 2001; DeLorme Street Atlas, 2000; MacroMap 2001 Metropolitan Phoenix; NOISEMAP Version 6.5.

The decrease in noise at ten of these locations would be a beneficial impact. The impact of increasing noise at five locations would be insignificant, because the increase would be 6 L_{dn} or less and would still be below the limits restricting new construction or expansion in these land use categories. In neighborhoods where noise levels would exceed 65 L_{dn} (such as Neighborhood/Intersection 4 in Table 4.4-3), expansions to existing dwellings would not be permitted.

Current noise complaints northeast of Luke AFB should decrease as more flights operate to the southwest, with operations to the southwest 94 percent of the time probably generating the least number of complaints. Additional noise complaints would likely not increase from areas southwest of Luke AFB, as the land is primarily agricultural and flights to the southwest have generated few complaints in the past. Operating to the southwest only 70 percent of the time would generate more overflights of El Mirage and other populated areas to the northeast, and thus would likely generate more noise complaints than would the 94 percent proportion of operations.

The increased noise levels would have a minor impact on the surrounding community regarding compatible land use, as defined by Air Force guidelines and subjective effects such as annoyance to local residents. The degree of impact is influenced by the receptors' familiarity with and attitude toward the noise source, and the time of day the noise occurs. The changes caused by the Proposed Action would not result in a significant impact.

The shifting of some flights to nighttime (10 p.m. to 7 a.m.) could cause an increase in human annoyance. Human response to noise is generally divided into three categories: physiological, which is primarily hearing loss; behavioral, which includes speech and sleep interference; and subjective, which is predominantly annoyance.

Annoyance is the primary consequence of aircraft noise. The feeling of annoyance is a complex response, and displays a wide range of response among individuals for a given noise level. Figure 4.4-5 shows the relationship between aircraft noise levels in residential communities near major airports and the annoyance response by exposed people (FAA, 1985).

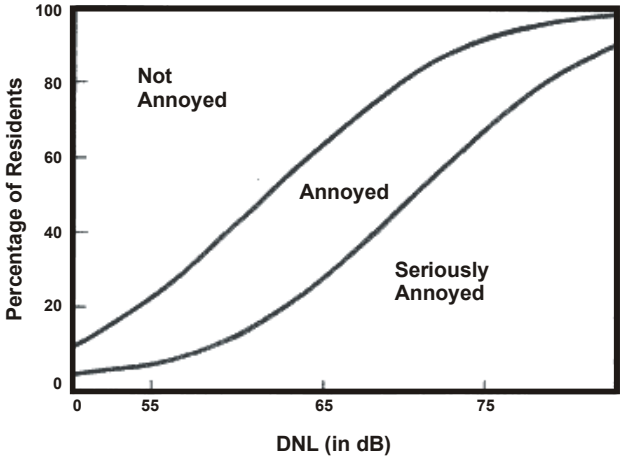

Figure 4.4-5. Relationship Between Noise Levels and Annoyance

Sleep interference is another response to aircraft noise. The threshold level of noise that can cause sleep interruption ranges from 35-70 dBA (Kryter, 1980). Additional nighttime flight activity could increase the degree of annoyance experienced by nearby noise-sensitive receptors, or interfere with sleep. An FAA study determined that psychological annoyance from the effects of sleep interference from aircraft noise is probably more significant than the direct physiological consequences. Sleep interference is likely to decrease after the receptor becomes accustomed to the new noise disturbance.

As noted previously, flight operations under the Proposed Action would be predominantly toward the more lightly-populated southwest, with fewer residents to be annoyed by nighttime operations. Impacts would be insignificant.

4.4.4.2. Proposed Action (Upper Bound), 94 Percent to Southwest

This section describes the potential impacts of the upper bound of the Proposed Action, reflecting 94 percent of operations to the southwest and 6 percent to the northeast.

4.4.4.2.1. Impacts to Land Use

Land use impacts from proposed operational changes at Luke AFB are shown in Figure 4.4-2. A total of approximately 10,980 acres (17.16 square miles), all within Maricopa County, would be affected by the Proposed Action 94 percent contour. Table 4.4-4 shows the amount of land, by land use, within the 65 L_{dn} and greater contours for this proportion.

About 83 percent of the land impacted by 65 L_{dn} and greater is off-base. Of the affected off-base land, about 82 percent is agricultural, with 10 percent open space, and 4 percent low-density residential. Recreation, public, industrial, and commercial land uses account for the remaining 4 percent of the affected off-base acreage. Less than one percent of the affected off-base land use is residential, and all of this is within the 65 to 69 L_{dn} noise levels.

About 76 percent of the low-density residential land use is within 65 to 69 L_{dn}, 16 percent is within 70 to 74 L_{dn}, 7 percent is within 75 to 79 L_{dn}, and 1 percent is within 80 to 84 L_{dn}. Affected low-density residential areas are in or near El Mirage, and unincorporated areas near Glendale, while the affected residential land is in Goodyear. Industrial and public land use within 65 or greater L_{dn} contours is located in or near El Mirage, Glendale, and Goodyear. The affected commercial area is located in unincorporated areas near Glendale.

On-base land accounts for 17 percent of the land impacted by 65 L_{dn} and greater. On-base land use includes 5 percent residential (family housing and dormitories) and 95 percent public (all other land uses); no other categories are used. About 65 percent of the on-base residential land lies within the 65-69 L_{dn} contour, with the remaining 35 percent within the 70-74 L_{dn} contour. Except for a few dormitories (see Section 4.4.2), no base residential areas are exposed to noise levels above 75 L_{dn}.

4.4.4.2.2. Impacts to Population

About 1,562 people would be affected by noise levels above 65 L_{dn} within the Proposed Action 94 percent contours. About 70 percent (1,092 people) of the total affected population within the 65 L_{dn} and above are on-base, with 30 percent (470 people) of the affected population residing off-base (see Table 4.4-5).

Of the affected off-base population, about 90 percent (423) reside in Glendale and adjacent unincorporated county, 7 percent (33) are in El Mirage and adjacent unincorporated county, with 3 percent (13) in Goodyear and adjacent unincorporated county. About 87 percent of the off-base population affected by the noise levels between 65 and 69 L_{dn} (an estimated 290 people) reside in Glendale, with about 11 percent in El Mirage (and adjacent unincorporated county), and 2 percent in Goodyear.

Table 4.4-4
Proposed Action Land Use Impacts (Acres), by Land Use Category[1]

	LR	*R*	*C*	*I*	*Ag*	*Rec*	*O*	*P*	*Total*
Proposed Action (Upper Bound): 94 Percent Of Operations To Southwest (L_{dn})									
On-base									
65-69	-	63.9	-	-	-	-	-	179.8	243.6
70-74	-	33.7	-	-	-	-	-	254.2	287.9
75-79	-	-	-	-	-	-	-	267.6	267.6
80-84	-	-	-	-	-	-	-	291.8	291.8
85+	-	-	-	-	-	-	-	795.3	795.3
Total On-base[2]	**-**	**97.6**	**-**	**-**	**-**	**-**	**-**	**1,788.7**	**1,886.3**
% of Total	*N/A*	*75.6%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*93.6%*	*17.2%*
Off-base									
65-69	285.9	31.4	47.2	7.9	3,870.4	81.2	298.5	113.7	4,736.2
70-74	61.4	-	22.9	0.0	2,265.9	51.0	273.1	-	2,674.3
75-79	27.2	-	-	3.1	945.0	23.5	232.1	6.9	1,237.8
80-84	4.0	-	-	-	346.1	-	59.3	2.3	411.7
85+	-	-	-	-	36.4	-	-	-	36.4
Total Off-base[2]	**378.6**	**31.4**	**70.1**	**11.0**	**7,463.8**	**155.6**	**863.0**	**122.9**	**9,096.4**
% of Total	*100.0%*	*24.4%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*6.4%*	*82.8%*
TOTAL[2]	**378.6**	**129.0**	**70.1**	**11.0**	**7,463.8**	**155.6**	**863.0**	**1,911.6**	**10,982.7**
% of Total Area of Affected CTs[3]	*0.03%*	*0.01%*	*0.01%*	*0.00%*	*0.61%*	*0.01%*	*0.07%*	*0.16%*	*0.90%*
Proposed Action(Lower Bound): 70 Percent of Operations to Southwest (L_{dn})									
On-base									
65-69	-	60.5	-	-	-	-	-	266.8	327.3
70-74	-	11.9	-	-	-	-	-	276.7	288.6
75-79	-	-	-	-	-	-	-	321.5	321.5
80-84	-	-	-	-	-	-	-	385.2	385.2
85+	-	-	-	-	-	-	-	823.6	823.6
Total On-base[2]	**-**	**72.4**	**-**	**-**	**-**	**-**	**-**	**2,073.8**	**2,146.2**
% of Total	*N/A*	*16.1%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*99.2%*	*18.0%*
Off-base									
65-69	442.4	377.3	-	35.5	3,921.4	125.7	379.7	5.2	5,287.2
70-74	48.8	-	4.6	12.6	2,438.4	54.4	343.6	10.4	2,912.8
75-79	23.4	-	-	-	969.4	14. 9	283.5	2.1	1,293.3
80-84	-	-	-	-	300.1	-	7.3	-	307.4
85+	-	-	-	-	-	-	-	-	-
Total Off-base[2]	**514.6**	**377.3**	**4.6**	**48.1**	**7,629.3**	**195.0**	**1,014.1**	**17.7**	**9,800.7**
% of Total	*100.0%*	*83.9%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*0.8%*	*82.0%*
TOTAL[2]	**514.6**	**449.7**	**4.6**	**48.1**	**7,629.3**	**195.0**	**1,014.1**	**2,091.5**	**11,946.9**
% of Total Area of Affected CTs[3]	***0.04%***	***0.04%***	***0.00%***	***0.00%***	***0.63%***	***0.02%***	***0.08%***	***0.17%***	***0.98%***

[1]Land use categories:

LR	Low-density residential	C	Commercial	Ag	Agricultural	O	Open Space
R	Residential	I	Industrial	Rec	Recreational	P	Public

[2]Numbers may not add due to rounding.

[3]This percentage was calculated by dividing the affected area under the contour by the total area of the ten affected census tracts (1,215,347 acres).

Source (Census data): USBC, 1999 and 2000

Table 4.4-5
Comparison of Noise Impacts to Population, by Alternative

Total Population, Affected Census Tracts[1]: 54,799

	Number	*Percent of Total CT Popl*	*Number*	*Percent of Total CT Popl*	*Number*	*Percent of Total CT Popl*	*Number*	*Percent of Total CT Popl*	*Number*	*Percent of Total CT Popl*
On-base										
Noise Level	***JLUS[2]***		***No Action***		***94 Percent Contour[3]***		***70 Percent Contour[3]***		***50 Percent Contour[3]***	
65-69[2]	3,525	*6.4%*	1,385	*2.5%*	537	*1.0%*	528	*1.0%*	787	*1.4%*
70-74	0	*0.0%*	641	*1.2%*	350	*0.6%*	405	*0.7%*	459	*0.8%*
75-79	0	*0.0%*	241	*0.4%*	191	*0.3%*	191	*0.3%*	150	*0.3%*
80-84	0	*0.0%*	164	*0.3%*	14	*0.0%*	14	*0.0%*	27	*0.0%*
85+	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*
Total	3,525	*6.4%*	2,431	*4.4%*	1,092	*2.0%*	1,138	*2.1%*	1,423	*2.6%*
Off-base										
Noise Level	***JLUS[2]***		***No Action***		***94 Percent Contour[3]***		***70 Percent Contour[3]***		***50 Percent Contour[3]***	
65-69[2]	6,092	*11.1%*	4,979	*9.1%*	290	*0.5%*	1,690	*3.1%*	3,253	*5.9%*
70-74	0	*0.0%*	511	*0.9%*	100	*0.2%*	123	*0.2%*	262	*0.5%*
75-79	0	*0.0%*	88	*0.2%*	65	*0.1%*	46	*0.1%*	38	*0.1%*
80-84	0	*0.0%*	45	*0.1%*	15	*0.0%*	9	*0.0%*	16	*0.0%*
85+	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*
Total	6,092	*11.1%*	5,623	*10.3%*	470	*0.9%*	1,868	*3.4%*	3,569	*6.5%*
Total										
Noise Level	***JLUS[2]***		***No Action***		***94 Percent Contour[3]***		***70 Percent Contour[3]***		***50 Percent Contour[3]***	
65-69[2]	9,617	*17.5%*	6,364	*11.6%*	827	*1.5%*	2,218	*4.0%*	4,040	*7.4%*
70-74	0	*0.0%*	1,152	*2.1%*	450	*0.8%*	528	*1.0%*	721	*1.3%*
75-79	0	*0.0%*	329	*0.6%*	256	*0.5%*	237	*0.4%*	188	*0.3%*
80-84	0	*0.0%*	209	*0.4%*	29	*0.1%*	23	*0.0%*	43	*0.1%*
85+	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*	0	*0.0%*
Total	9,617	*17.5%*	8,054	*14.7%*	1,562	*2.9%*	3,006	*5.5%*	4,992	*9.1%*

[1]Total population is the total for the 10 affected census tracts that lie (at least in part) under the JLUS contour.

[2]The JLUS contour includes all noise levels above 65 L_{dn}, not only 65-69 L_{dn}.

[3]The "94 percent contour," "70 percent contour," and "50 percent contour" reflect the proportion of operations to the southwest.

Source: USBC, 2000; NOISEMAP 6.5.

An estimated 100 people reside in areas with noise levels between 70 and 74 L_{dn}; of these, 95 percent reside in Glendale, and 5 percent in Goodyear. Of the affected population between 75 and 79 L_{dn} (an estimated 65 people), 94 percent reside in Glendale and adjacent unincorporated county, and 6 percent in Goodyear. All of the estimated 15 people residing between 80 and 84 L_{dn} reside in an unincorporated area near Glendale. There are no residents in areas of 85 or greater L_{dn}.

About 50 percent of the on-base population reside within the 65-69 L_{dn} contour, with 32 percent within the 70-74 L_{dn} contour and 18 percent above 75 L_{dn} (see Section 4.4.2).

The 94 percent contour of the Proposed Action would affect fewer people and less residential area than the Implementation Alternative and No Action Alternative.

4.4.4.2.3. Relationship to JLUS Contour

With 94 percent of operations to the southwest, the 65 L_{dn} contour would extend outside of the JLUS contour into the corner of a residential area southeast of W. Indian School Road and N. Sarival Road, into agricultural land and a small area of commercial land southwest of W. Indian School Road and N. Sarival Road, and into agricultural land northeast of W. Indian School Road and N. Citrus Road (see Figure 4.4-2). The impacts of these exceedances of the JLUS would be insignificant, as they occur within the context of the territory within a military airport. The only land use impact would be to preclude construction of a school or expansion of existing dwellings in these areas. If schools were to be required for future developments close to these sites, they could be built within ¼ of a mile of these areas. The 65 L_{dn} contour would not exceed the JLUS contour in residential areas in El Mirage, as it does under baseline conditions; this would be an improvement over baseline conditions.

4.4.4.3. Proposed Action (Lower Bound), 70 Percent to Southwest

This section describes the potential impacts of the lower bound of the Proposed Action, reflecting 70 percent of operations to the southwest and 30 percent to the northeast. (This set of contours is also the upper bound of the Implementation Alternative.)

4.4.4.3.1. Impacts to Land Use

Contours and land use with a proportion of 70 percent of operations to the southwest and 30 percent to the northeast are shown in Figure 4.4-3. The total amount of land affected by aircraft operations would be approximately 11,950 acres (18.67 square miles), all within Maricopa County. Table 4.4-4 shows the amount of land within the 65 L_{dn} and greater contours according to land use.

About 82 percent of the land impacted by 65 L_{dn} and greater is off-base. Of the off-base land, about 78 percent is agricultural, with 10 percent open space, 5 percent low-density residential, and 4 percent residential. Recreation, industrial, and public land uses account for 3 percent of the affected off-base acreage. Only five acres (less than 0.1 percent of the affected off-base area) is commercial.

Approximately 86 percent of the low-density residential land use is within 65 to 69 L_{dn}, 9 percent is within 70 to 74 L_{dn}, and 5 percent is within 75 to 79 L_{dn}. Affected low-density residential is in or near El Mirage and unincorporated areas near Glendale. All of the affected off-base residential land is within the 65-69 L_{dn} and is located in El Mirage and Goodyear. Industrial and public land use in 65 or greater L_{dn} is located in or near El Mirage, Glendale, and Goodyear.

About 18 percent of the affected land is on-base, where land use includes 3 percent residential and 97 percent public land use. The on-base residential areas are predominantly within the 65-69 L_{dn} contour (84 percent), with all of the remainder within the 70-74 L_{dn}

contour. Except for a few dormitories (see Section 4.4.2), no base residential areas are exposed to noise levels above 75 L_{dn}.

4.4.4.3.1. Impacts to Population

About 3,006 people would be affected by noise levels above 65 L_{dn} within the 70 percent contours. About 38 percent (1,138 people) of the total affected population within the 65 L_{dn} and above baseline contours reside on-base, with 62 percent (1,868 people) of the affected population residing off-base (see Table 4.4-5).

About 75 percent of the affected off-base population resides in El Mirage (and adjacent unincorporated county), 24 percent in Glendale (and adjacent unincorporated county), and less than 1 percent in Goodyear and Surprise (and unincorporated county adjacent to both towns). About 82 percent of the off-base population affected by the noise levels between 65 and 69 L_{dn} (an estimated 1,690 people) reside in El Mirage, with about 18 percent in Glendale and adjacent unincorporated county, and less than 1 percent in Goodyear and Surprise. Of the affected population between 70 and 74 L_{dn} (an estimated 123 people), 88 percent reside in Glendale, 8 percent reside in El Mirage, and 4 percent in Goodyear. Of the affected population between 75 and 79 L_{dn} (an estimated 46 people), 96 percent reside in Glendale (and adjacent unincorporated county), and 4 percent in Goodyear and adjacent unincorporated county). All of the estimated 9 people within the 80 and 84 L_{dn} noise levels reside in an unincorporated area near Glendale. There are no residents in areas of 85 or greater L_{dn} (see Table 4.4-5).

About 46 percent of the on-base population reside within the 65-69 L_{dn} contour, with 36 percent within the 70-74 L_{dn} contour and 18 percent above 75 L_{dn} (see Section 4.4.2).

The 70 percent contours (lower bound) of the Proposed Action would affect more people than the 94 percent contours (upper bound). However, fewer people would be affected under either contour of the Proposed Action than under the 50 percent contour of the Implementation Alternative or under the No Action Alternative.

The amount of residential area impacted would also be less than under the 50 percent contour (lower bound of the Implementation Alternative) or under the No Action Alternative.

4.4.4.3.2. Relationship to JLUS Contour

With 70 percent of operations to the southwest, the 65 L_{dn} contour would extend slightly outside of the JLUS into agricultural land northeast of W. Indian School Road and N. Citrus Road (see Figure 4.4-3). It also exceeds the JLUS slightly on the eastern side of the contour, into agricultural land near the intersections of W. Thomas Road and N. Cotton Lane, and W. Indian School Road and N. Sarival Road. A small exceedance occurs into residential land southeast of the intersection of W. Indian School Road and N. Sarival Road. The impacts of these exceedances would be insignificant, because they occur within the context of the territory within a military airport, and the amount of land is very small. The 65 L_{dn} contour would not exceed the JLUS contour in residential areas in El Mirage, as it does under baseline conditions; this would be an improvement over baseline conditions.

4.4.5. Potential Impacts of the Implementation Alternative

Under the Implementation Alternative, between 50 and 70 percent of operations would occur to the southwest, and there would be the same slight increase in the number of nighttime flights as under the Proposed Action. The total number of operations would not change. The proportion of flights taking off to the southwest would increase compared to the No Action Alternative, but not as much as the Proposed Action. Consequently, noise-related impacts to land use and population would be greater than under the Proposed Action but less than under the No Action Alternative.

4.4.5.1. Impacts to the Noise Environment

Table 4.4-6 provides estimates of sound levels under the Implementation Alternative at sensitive receptor locations, as measured by L_{dn}. Noise levels in L_{dn} units, as compared to baseline conditions, would decrease at ten locations and increase at five locations under both ranges of the Implementation Alternative. The five locations where noise levels would increase are Perryville Women's Center, Scott Libby Elementary School, and three neighborhood intersections (the intersections of N. 181st Avenue and W. Lynwood Street, and N. Sarival Road and W. Indian School Road, both in Goodyear, and the intersection of N. 191st Avenue and W. McDowell Road in Buckeye). The decrease in noise at 10 of the 15 locations would be beneficial. The impact of increasing noise at five locations would be insignificant because the increase would be slight (5 L_{dn} or less), and would still be below the limits specified for new construction or expansion in these land use categories. Noise complaints should decrease as more flights operate to the southwest over less densely populated areas.

The increased noise levels would have a minor impact on the surrounding community in terms of compatible land use as defined by Air Force guidelines, and subjective effects such as annoyance to local residents. The change caused by the Implementation Alternative would be an insignificant impact.

The shifting of some flights to nighttime (10 p.m. to 7 a.m.) would also occur under the Implementation Alternative. Impacts would be as described under the Proposed Action. Since the Implementation Alternative involves more operations over populated areas, impacts would be slightly greater than under the Proposed Action, but still insignificant.

4.4.5.2. Implementation Alternative (Upper Bound), 70 Percent to Southwest

Figure 4.4-3 illustrates noise contours overlying a land use map generated from 70 percent of operations to the southwest. The analysis of data on impacts to land use and people is found under the Proposed Action (Lower Bound) 70 percent contour discussion (Section 4.4.4.3).

4.4.5.3. Implementation Alternative (Lower Bound), 50 Percent to Southwest

This section describes the potential impacts of the lower bound of the Implementation Alternative, reflecting 50 percent of operations to the southwest and 50 percent to the northeast.

Table 4.4-6
Noise Levels at Sensitive Receptor and Other Locations, Implementation Alternative

Name	*Location with Latitude and Longitude*	*Noise Level in Decibels (L_{dn}[1])*	
		70 Percent to Southwest	**50 Percent to Southwest**
Dysart High School	N. Dysart Road and Varney Road, El Mirage Lat 33°35.286'N., Long 112°20.433'W.	60.04	62.19
Dysart Junior High School	11405 N. Dysart Road, El Mirage Lat 33°35.603'N., Long 112°20.500'W.	56.57	58.69
El Mirage Baseball Park	W. Waddell Road and N. El Mirage Road, El Mirage Lat 33°36.552'N., Long 112°19.493'W.	57.53	59.48
El Mirage Elem. School	12308 W. Waddell Road, El Mirage Lat 33°36.546'N., Long 112°19.500'W.	57.51	59.45
El Mirage Library	N. El Mirage Road and W. Ventura Street, El Mirage Lat 33°36.649'N., Long 112°19.496'W.	57.10	59.03
Fowler Park	Northeast of N. Litchfield Road and W. Glendale Avenue, Glendale Lat 33°32.478'N., Long 112°20.174'W.	57.01	57.33
Ludden Park	N. Capistrano Drive and W. Waddell Road, El Mirage Lat 33°36.519'N., Long 112°19.496'W.	57.65	59.60
Luke Elem. School	W. Thunderbird Street and Navajo Circle, Glendale Lat 33°32.413'N., Long 112°20.525'W.	59.41	59.77
Perryville Women's Center	Northwest of N. Citrus Road and W. McDowell Road, Goodyear Lat 33°28.176'N., Long 112°26.824'W.	64.86	63.52
Scott Libby Elem. School	18706 W. Thomas Road, Maricopa County Lat 33°28.718'N., Long 112°27.728'W.	60.04	58.65
Western Sky Middle School	4095 N. 144th Avenue, Litchfield Park Lat 33°29.589'N., Long 112°22.108'W.	49.18	48.69
Neighborhood / Intersection 1	Intersection of N. 181st Avenue and W. Lynwood Street, Goodyear Lat 33°27.854'N., Long 112°26.913'W.	62.05	60.66
Neighborhood / Intersection 2	Immediately W. of Intersection of W. Rose Lane/ Claremont and N. Cotton Lane, Maricopa County Lat 33°31.587'N., Long 112°25.692'W.	62.14	61.01
Neighborhood / Intersection 3	Intersection of N. 191st Ave and W. McDowell Road, unincorp. Maricopa County / Buckeye Lat 33°27.882'N., Long 112°28.215'W.	62.29	60.85
Neighborhood / Intersection 4	Intersection of N. Sarival Road and W. Indian School Road, Goodyear Lat 33°29.620'N., Long 112°24.570'W.	65.54	64.08

[1] L_{dn}: Day-Night Average Sound Level (an averaged measure that describes the 24-hour or daily noise environment)

Source: Maricopa County Assessors Office GIS Map, 2001; DeLorme Street Atlas, 2000; MacroMap 2001 Metropolitan Phoenix; NOISEMAP Version 6.5.

4.4.5.3.1. Impacts to Land Use

Contours and land use with a proportion of 50 percent of operations to the southwest and 50 percent to the northeast are shown in Figure 4.4-4. The total amount of land affected by this directional proportion of aircraft operations would be approximately 12,240 acres (19.13 square miles), all within Maricopa County. Table 4.4-7 shows the amount of land within the 65 L_{dn} and greater contours according to land use.

About 82 percent of the land impacted by 65 L_{dn} and greater is off-base. Approximately 74 percent of the affected off-base land is agricultural, with 11 percent open space, 7 percent residential, and 5 percent low-density residential. Recreation, industrial, public, and commercial land uses account for 5 percent of the affected off-base acreage. Of the affected off-base residential land, about 93 percent is within 65 to 69 L_{dn} and 7 percent is within 70 to 74 L_{dn}; all is located in El Mirage. Nearly 66 percent of the low-density residential land use is within 65 to 69 L_{dn}, 34 percent is within 70 to 74 L_{dn}, and less than 0.5 percent is within 75 to 79 L_{dn}. Affected low-density residential land is located in or near El Mirage and in unincorporated areas near Glendale. Recreation, industrial, public, and commercial land use within 65 or greater L_{dn} is located in or near El Mirage, Glendale, and Goodyear.

Affected on-base land accounts for 18 percent of the total affected area, and land uses on-base include 5 percent residential and 95 percent public land use. Approximately 76 percent of on-base residential areas lie within the 65-69 L_{dn} contour, with the remaining 24 percent within the 70-74 L_{dn} contour.

4.4.5.3.2. Impacts to Population

Under the 50 percent contour, about 4,992 people would be affected by noise levels above 65 L_{dn}. Off-base residents account for about 72 percent (3,569 people) of the affected population within the 65 L_{dn} and above baseline contours. About 82 percent (2,914) of these off-base residents are in El Mirage and adjacent unincorporated county, nearly 18 percent (632) are in Glendale and adjacent unincorporated county, and less than 1 percent (23) are in Surprise, Goodyear, and adjacent unincorporated county areas (see Table 4.4-5).

An estimated 3,253 people off-base are affected by noise levels between 65 and 69 L_{dn}. Of these, about 85 percent reside in El Mirage, with nearly 15 percent in Glendale and adjacent unincorporated county, and less than 1 percent in Surprise and Goodyear (see Table 4.4-5). Of the affected population within the 70-74 L_{dn} noise levels (an estimated 262 people), 58 percent reside in El Mirage, 40 percent in Glendale, and 2 percent in Goodyear. Of the affected population within the 75-79 L_{dn} noise levels (an estimated 38 people), 97 percent reside in Glendale and adjacent unincorporated county, and 3 percent in Goodyear. All the estimated 16 people residing within the 80-84 L_{dn} noise levels are in an unincorporated area near Glendale. There are no residents in areas of 85 or greater L_{dn}.

About 28 percent (1,423 people) of the total affected population reside on-base. Approximately 55 percent of these reside in areas with noise levels between 65 and 69 L_{dn}, 32 percent between 70 and 74 L_{dn} , 11 percent between 75 and 79 L_{dn} , and only 2 percent at 80 L_{dn} or above.

Table 4.4-7
Implementation Alternative Land Use Impacts (Acres), by Land Use Category[1]

	LR	*R*	*C*	*I*	*Ag*	*Rec*	*O*	*P*	*Total*
Implementation Alternative (Upper Bound): 70 Percent Of Operations To Southwest (L_{dn})									
On-base									
65-69	-	60.5	-	-	-	-	-	266.8	327.3
70-74	-	11.9	-	-	-	-	-	276.7	288.6
75-79	-	-	-	-	-	-	-	321.5	321.5
80-84	-	-	-	-	-	-	-	385.2	385.2
85+	-	-	-	-	-	-	-	823.6	823.6
Total On-base[2]	**-**	**72.4**	**-**	**-**	**-**	**-**	**-**	**2,073.8**	**2,146.2**
% of Total	*N/A*	*16.1%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*99.2%*	*18.0%*
Off-base									
65-69	442.4	377.3	-	35.5	3,921.4	125.7	379.7	5.2	5,287.2
70-74	48.8	-	4.6	12.6	2,438.4	54.4	343.6	10.4	2,912.8
75-79	23.4	-	-	-	969.4	14. 9	283.5	2.1	1,293.3
80-84	-	-	-	-	300.1	-	7.3	-	307.4
85+	-	-	-	-	-	-	-	-	-
Total Off-base[2]	**514.6**	**377.3**	**4.6**	**48.1**	**7,629.3**	**195.0**	**1,014.1**	**17.7**	**9,800.7**
% of Total	*100.0%*	*83.9%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*0.8%*	*82.0%*
TOTAL[2]	**514.6**	**449.7**	**4.6**	**48.1**	**7,629.3**	**195.0**	**1,014.1**	**2,091.5**	**11,946.9**
% of Total Area of Affected CTs[3]	*0.04%*	*0.04%*	*0.00%*	*0.00%*	*0.63%*	*0.02%*	*0.08%*	*0.17%*	*0.98%*
Implementation Alternative (Lower Bound): 50 Percent Of Operations To Southwest (L_{dn})									
On-base									
65-69	-	80.4	-	-	-	-	-	230.4	310.8
70-74	-	25.7	-	-	-	-	-	258.3	284.0
75-79	-	-	-	-	-	-	-	326.3	326.3
80-84	-	-	-	-	-	-	-	408.2	408.2
85+	-	-	-	-	-	-	-	823.5	823.5
Total On-base[2]	**-**	**106.2**	**-**	**-**	**-**	**-**	**-**	**2,046.7**	**2,152.8**
% of Total	*N/A*	*13.7%*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*98.2%*	*17.6%*
Off-base									
65-69	345.7	625.6	8.2	51.0	3,696.0	178.6	577.4	28.9	5,511.4
70-74	177.7	43.8	5.0	21.9	2,350.8	35.9	347.0	8.6	2,990.7
75-79	2.4	-	-	-	1,086.2	17.7	184.2	-	1,290.5
80-84	-	-	-	-	288.3	-	5.6	-	293.9
85+	-	-	-	-	-	-	1.6	-	1.6
Total Off-base[2]	**525.8**	**669.4**	**13.3**	**72.9**	**7,421.3**	**232.2**	**1,115.8**	**37.5**	**10,088.1**
% of Total	*100.0%*	*86.3%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*1.8%*	*82.4%*
TOTAL[2]	**525.8**	**775.5**	**13.3**	**72.9**	**7,421.3**	**232.2**	**1,115.8**	**2,084.1**	**12,240.9**
% of Total Area of Affected CTs[3]	*0.04%*	*0.06%*	*0.00%*	*0.01%*	*0.61%*	*0.02%*	*0.09%*	*0.17%*	*1.01%*

[1]Land use categories:

LR	Low-density residential	C	Commercial	Ag	Agricultural	O	Open Space
R	Residential	I	Industrial	Rec	Recreational	P	Public

[2]Numbers may not add due to rounding.

[3]This percentage was calculated by dividing the affected area under the contour by the total area of the ten affected census tracts (1,215,347 acres).

Source (Census data): USBC, 2000

The 50 percent contours of the Implementation Alternative would affect more people than the Proposed Action or the 70 percent upper bound of the Implementation Alternative, but fewer people than the No Action Alternative. The amount of residential acreage impacted would be more than under the Proposed Action and No Action.

4.4.5.3.3. Relationship to JLUS Contour

With 50 percent of operations to the southwest, the 65 L_{dn} contour would extend outside of the JLUS into a residential area of El Mirage (south of W. Waddell Road and Grand Avenue), but to a lesser extent than the No Action Alternative, which also includes industrial and agricultural land (see Figure 4.4-1). The impacts of these exceedances of the JLUS would be insignificant, because they occur within the context of the territory within a military airport. The 50 percent contour would not exceed the JLUS anywhere to the southwest of Luke AFB.

4.4.6. Potential Impacts of the No Action Alternative

Under the No Action Alternative, Luke AFB aircraft would cease the temporary changes that have occurred, and return to arriving and departing approximately 30 percent of the time to the southwest and 70 percent to the northeast. The increase in the proportion of nighttime operations would not occur. Impacts to the noise environment, land use, and population would be generally greater than the impacts under the Proposed Action or Implementation Alternative, but would not be significant. Noise complaints, most of which currently originate from northeast and east of Luke AFB, would likely return to levels generated when most flights departed to the northeast.

Land use and population impacts under the No Action Alternative (baseline) are described in Section 3.4.6. As noted there, noise impacts would primarily affect El Mirage and unincorporated areas near Glendale. The No Action Alternative would affect a greater number of people and more acreage than the Proposed Action or Implementation Alternative. This alternative would affect more low-density residential acreage than any other alternative, and more residential area than the 94 percent and 70 percent contours.

Relationship to JLUS Contour. The No Action Alternative 65 L_{dn} contour exceeds the JLUS contour in four places. Northeast of the intersection of W. Waddell Road and N. El Mirage Road, the contour affects residential, industrial, and agricultural land outside of the JLUS. West of Luke AFB, the 30-70 (No Action) contour affects areas of agricultural land north of W. Northern Avenue and east of N. Sarival Road, north and south of W. Glendale Avenue east of its intersection with N. Cotton Lane, and small portions of residential land and open space southwest of the same intersection. To the southeast of Luke AFB, there is a small exceedance south of W. Bethany Home Road that affects open space. The impacts of these JLUS exceedances would be insignificant as they occur within the context of the territory within a military airport. The only land use impact would be to preclude construction of facilities such as schools in these areas. If schools were to be required for future developments close to these sites, they could be built within about ¼ of a mile of these areas.

4.4.7. Mitigation Measures

No significant impacts to compatible land uses or noise sensitive receptors have been identified. Aircraft operational practices and control measures would continue to be implemented to ensure that adverse impacts remain insignificant. Luke AFB regulations identify avoidance of specific areas and permissible flight altitudes over noise-sensitive areas. This information is routinely provided to the pilots.

The changes in flight operations, and resulting shifts in the location of noise impacts, would cause insignificant impacts to land use compatibility around Luke AFB. However, base practices include advising local governments and community planners of changes in day-night average sound levels for incorporation into existing land use plans. Additionally, the Air Force has participated in local land use planning by preparing and updating AICUZ studies to encourage compatible land development in the Luke AFB environs. These studies are provided to the public to ensure that noise-related impacts to the populace are kept to a minimum.

4.5. SOCIOECONOMICS

Socioeconomic resources could be affected by land use changes that would occur with the adoption of noise contours associated with the Proposed Action or Implementation Alternative. Changes in allowable land use could affect the economic value of certain land parcels. However, because the JLUS contours and the resulting land use constraints have been codified into law by the Arizona legislature, economic effects of the Proposed Action or Implementation Alternative would occur only where the contours related to those two alternatives would fall outside the existing JLUS contours. Impacts under the Proposed Action or the Implementation Alternative would be insignificant. The impacts of the No Action Alternative would be greater than those under the Proposed Action or Implementation Alternative, but would still be insignificant.

4.5.1. Significance Criteria

Significance criteria for socioeconomic resources are determined by analyzing long-term fluctuation in elements such as population and income within each ROI. This approach allows an ROI-specific determination of the appropriate levels, or thresholds, beyond which changes in population or employment would noticeably affect individuals and communities. As noted in Section 3.5, no changes are projected for population as a result of any alternative assessed in this EA, so no criteria are identified. A significant impact for the ROI would be a change of more than 5.0 percent in projected income.

4.5.2. Analysis Methods

Measures used for impact analysis include population and income. Population data were obtained from the U.S. Census of Population and Housing for 2000 and the U.S. Bureau of Economic Analysis (2001). Sub-county level income data were obtained from the 1990 Census of Population and Housing; as noted in Section 3.5.3, income data from the 2000 Census have not yet been released. The noise contours for the JLUS, Proposed Action, Implementation Alternative, and No Action Alternative were compared (see Section 4.4 for a thorough analysis of this comparison) to assess potential economic impacts of the

various alternatives. The impacts to population currently affected by noise impacts under the JLUS and No Action Alternative are addressed in Section 3.4; Section 4.4 discusses potential noise impacts to population under the Proposed Action and the Implementation Alternative. Impacts that could potentially lead to changes in population or income levels are discussed in the following sections.

4.5.3. Potential Impacts of the Proposed Action

There would be no impacts to population as a result of the Proposed Action, which includes neither construction nor changes to permanent personnel levels at Luke AFB. Therefore, no impacts to population levels in the ROI would occur.

As discussed in Section 4.4.4.2, land use constraints under the Proposed Action would be limited to a few small areas (nearly all is agricultural land) where the 94 percent and 70 percent contours exceed the JLUS contour. For these areas, impacts would only occur for particular types of future land uses, such as construction of a new school. Because these areas are very small, and because other land outside the 65 dB contour would be available for construction, there would be only insignificant economic impacts to landowners and others from these additional constraints, and negligible income impacts in the ROI.

There could be localized impacts to landowners or property developers planning to construct retirement communities or other types of developments that feature a golf course or other type of outdoor recreation facilities. If these projected developments were in areas experiencing higher levels of aircraft noise (e.g., southwest of Luke AFB), there could be a localized adverse, but insignificant, impact to a specific developer or landowner due to the increased outdoor noise levels. (Indoor noise attenuation is already required under the provisions of Arizona law.) However, these parcels would be available for other types of development (e.g., commercial) not featuring an outdoor component, so economic impacts to developers and landowners would be insignificant. Other land parcels are available for development in the area, so impacts to ROI income would be negligible. There would be no impacts to population as a result of the Proposed Action.

4.5.4. Potential Impacts of the Implementation Alternative

Impacts to socioeconomic resources under the Implementation Alternative would be similar to but less than those under the Proposed Action. The JLUS exceedances of the 70 percent noise contour are smaller than those of the 94 percent contour, and affect mostly agricultural lands. The 50 percent noise contour has the smallest amount of exceedance, but primarily affects residential land use in the El Mirage area. Impacts to community development in El Mirage could be adverse but insignificant. Economic impacts to landowners or developers, and to ROI income, would be insignificant due to the availability of other land for development. There would be no impacts to population.

4.5.5. Potential Impacts of the No Action Alternative

Under the No Action alternative, there is substantially more exceedance of the JLUS contour than under either the Proposed Action or the Implementation Alternative, with two-thirds of the exceedance affecting existing residential land use in El Mirage and nearby areas. Potential impacts to developers and landowners would be greater than under the other two alternatives, although the impacts would still be insignificant. The No

Action Alternative involves operations over one of the more heavily populated areas near Luke AFB, an older municipal area to the northeast that could benefit from economic development. The No Action Alternative could have an adverse but insignificant impact on potential economic development that could bring additional income to this area. Impacts to ROI income would be insignificant. There would be no impacts to population.

4.5.6. Mitigation Measures

No socioeconomic mitigation measures are required.

4.6. ENVIRONMENTAL JUSTICE

Environmental justice impacts could occur as a result of land use changes that would occur with the adoption of noise contours associated with the Proposed Action or Implementation Alternative, if the changes were to affect low-income or minority populations disproportionately. Minority and low-income populations occur throughout the ROI at varying proportions, with the largest concentration that would be affected by changes in noise contours being located in El Mirage. Under the Proposed Action, noise levels in that area (northeast of Luke AFB) would be substantially reduced in the El Mirage area. Under the Implementation Alternative, the improvement in noise levels would be similar to the Proposed Action, but slightly less. Under the No Action Alternative, departures and arrivals would resume over El Mirage and other heavily populated communities to the northeast, resulting in an adverse but insignificant impact.

4.6.1. Significance Criteria

A significant environmental justice impact would be a serious or long-term health, environmental, cultural, or economic effect that disproportionately affected a nearby minority or low-income population, rather than all nearby residents. A minor or short-term health, environmental, cultural, or economic effect that disproportionately affected a nearby minority or low-income population would not be a significant impact. No environmental justice impacts would occur if the environment was not affected, or if there were no minority or low-income populations in the vicinity of an action. A beneficial impact would result from an improvement in health, environmental, cultural, or economic effects to an affected population.

4.6.2. Analysis Methods

Measures used for impact analysis include demographic (ethnic) and poverty data. Demographic data were obtained from the USBC for the 2000 Census, while poverty data were acquired from the 1990 Census of Population and Housing. The USBC has not yet released Census 2000 income and poverty data for sub-county units, and comparable and reliable inter-census data are not available at the sub-county level. For this reason, it is necessary to use data from the 1990 Census. The noise contours for the JLUS, Proposed Action, Implementation Alternative, and No Action Alternative were compared (see Section 4.4 for a thorough analysis of this comparison) to assess potential environmental justice impacts of the various alternatives. Data for the affected census tracts were compiled and assessed within the context of the potential land use changes for each alternative.

4.6.3. Potential Impacts of the Proposed Action

Under the Proposed Action, departures and arrivals over the heavily populated areas to the northeast would be greatly reduced. This area includes the community of El Mirage, which is two-thirds Hispanic and has nearly one-third of its population below poverty. The reduced noise levels under the Proposed Action would improve noise conditions in this area. Improvements would be greater under the 94 percent set of contours than under the 70 percent set. Adverse impacts to the communities northeast of Luke AFB would be insignificant. The areas in which noise levels would increase, to the southwest of Luke AFB, are much less heavily settled, and no concentrations of low-income or minority were identified. Noise impacts would not disproportionately affect low-income or minority populations; therefore, no adverse environmental justice impacts would occur.

4.6.4. Potential Impacts of the Implementation Alternative

The improved noise conditions over the El Mirage area that were identified under the Proposed Action would also occur under the Implementation Alternative, but improvements would be somewhat less. Under this alternative, there would be a higher proportion of aircraft arrivals and departures over the northeast (and its concentration of low-income and minority population in El Mirage) than would be the case under the Proposed Action, but less than under the No Action Alternative. Improvements would be greater under the 70 percent contours than under the 50 percent contours.

The improved noise conditions under the Implementation Alternative would be less than under the Proposed Action but greater than under the No Action Alternative. There would be insignificant adverse impacts to the northeast, and no environmental justice impacts to the southwest.

4.6.5. Potential Impacts of the No Action Alternative

Under the No Action alternative, departures and approaches over the northeast would resume. This area would experience an adverse but insignificant environmental justice impact. There would be no environmental justice impacts to other areas of the ROI.

4.6.6. Mitigation Measures

No environmental justice mitigation measures are required.

4.7. COMPATIBILITY OF THE PROPOSED ACTION WITH OBJECTIVES OF FEDERAL, STATE, AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS

The Proposed Action or Implementation Alternative would be compatible with existing federal, state, and local land use plans, policies, and controls. Section 3.4.4 includes a discussion of land use requirements derived from the Joint Land Use Study; noise contours from this study were codified into law by the Arizona Legislature in 1995 (A.R.S. Sec. 28-8462). The changes in noise contours derived from implementing aircraft operations as planned would decrease the amount of land use within residential areas (with restrictions on development) and increase the amount of land designated for agricultural use (a land use category with no noise restrictions). Also, the Proposed Action or Implementation

Alternative would both be compatible with the Air Force's objective of working with local land use planners to reduce impacts to developed properties and high-growth areas.

4.8. RELATIONSHIPS BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

The Proposed Action or Implementation Alternative would not result in the disturbance of land because no construction would be involved. No croplands, wooded areas, wetlands, or other natural resources would be affected as a result of the Proposed Action or Implementation Alternative. Consequently, productivity of the area would not be degraded.

4.9. CUMULATIVE IMPACTS

Cumulative impacts are those changes to the physical and biological environments that would result from the Proposed Action in combination with past, present, and reasonably foreseeable future actions. Significant cumulative impacts could result from impacts that are not significant individually, but when considered together, are collectively significant.

Expanding urban growth makes it increasingly difficult for the Air Force to maintain operational integrity without impacting the surrounding communities. Regardless of an increase in noise exposure, impacts to areas within the 65 L_{dn} contour remain unavoidable. The proposed changes in operations at Luke AFB could result in a long-term shift in impacts from areas northeast of Luke AFB to areas southwest of the base. These changes would occur within the context of flight patterns originating from several airports in the region and constitute a small fraction of total flights in the area. The changes in operations would be insignificant when considered in relation to these other flights.

Overall emissions from aircraft could decrease slightly as a result of the Proposed Action or Implementation Alternative. Based on land use maps and predicted noise contours, noise levels would increase slightly in agricultural land use areas and decrease in residential areas. The use of land for agricultural purposes is not limited by the intensity of aircraft-generated noise, while residential land use is limited by noise levels. Consequently, impacts predicted for noise, air, and other resource elements would not cause significant cumulative impacts when considered with other ongoing and planned activities on-base and in the base area.

4.10. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The irreversible and irretrievable commitment of resources would involve the use of materials, energy, and economic resources. The Proposed Action, Implementation Alternative, and No Action Alternative all require ordinary materials such as oil and fuel. The amounts of resource consumption are not expected to increase beyond current usage. These materials would, except for recyclable items, be irretrievably committed. Electrical energy and various types of fuel from maintenance and security activities would also be irretrievably consumed. Since no construction would be involved under the Proposed Action or Implementation Alternative, no long-term commitment of construction resources would be required.

CHAPTER 5
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5. REFERENCES

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CHAPTER 6

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